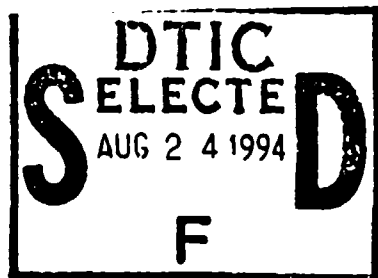


# NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA

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## THESIS

**US ARMY'S DELAY ENTRY PROGRAM:  
A SURVIVAL STUDY**

by

Jeffrey S. Vales

June 1994

Thesis Advisor:

Lyn Whitaker

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US Army's Delay Entry Program:  
A Survival Study

by

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Submitted in partial fulfillment  
of the requirements for the degree of

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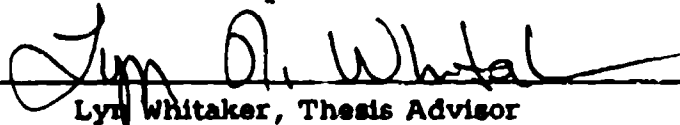
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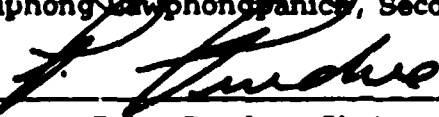
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## ABSTRACT

The Delayed Entry Program (DEP) has served a variety of roles in the recruiting process. In general, it acts as an inventory system of recruits which can be used to smooth out seasonal fluctuations in demand for basic and advanced individual training. It also serves to address the routine seasonal fluctuations in the recruiting process itself. DEP losses, or those individuals that renege on the agreement made with the Army to attend basic training, are a costly aspect of the program. Several studies have examined a number of aspects associated with DEP losses. When setting recruiting goals, Army analyst must consider the pool of individuals who are already in DEP. This thesis attempts to provide a method to estimate how many of those in DEP will survive to the end of the contract and enter basic training. Specifically, this thesis estimates survival probabilities as a function of time spent in DEP, contract length and other pertinent variables.

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## **EXECUTIVE SUMMARY**

### **Background:**

The US Army along with other military services, government organizations and private enterprises need qualified "entry level" individuals to meet present and future manning levels. The Army must actively recruit these individuals to meet target levels. The Delayed Entry Program (DEP) has served a variety of roles in the recruiting process. In general, it acts as an inventory system of recruits which can be used to smooth out seasonal fluctuations in demand for basic and advanced individual training. It also serves to deal with the routine seasonal fluctuations in the recruiting process itself. DEP losses, or those individuals that renege on the agreement made with the Army to attend basic training, are a costly aspect of recruiting. Because of DEP losses, the Army must be careful when setting goals for its recruiters.

### **Purpose:**

When setting recruiting goals, Army analysts must consider the pool of individuals who are already in DEP. Therefore, the question is posed: How many of those in the DEP pool will survive to the end of the DEP and enter basic training? We look for a methodology for estimating how many individuals in the DEP inventory pool will survive the program and access

into the Army. An accurate estimate of DEP survivors (accessions) would assist analyst in setting recruiter goals.

#### Framework:

In pervious research, demographic characteristics believed to be related to DEP survival (or DEP loss) have be studied. This thesis takes into account some of these demographic characteristics in addressing DEP survival as a function of time already spent in DEP. The logit model applied in this thesis was derived from the statistical literature on analyses of ordinal categorical data.

#### Approach:

Demographic characteristics, DEP contract length and time in DEP when lost were obtained from the United States Recruiting Command (USAREC) Mini-master file. The modeling effort was restricted to male high-school graduates who score on the top 50 percentile of the Armed Forces Qualification Test (AFQT). USAREC considers this individual a GMA candidate, the most populous recruit category.

Because DEP losses do not occur uniformly over the length of a contract, obtaining the general structure of losses was imperative. A loglinear regression model assisted in determining a method for combining months with few losses. This greatly reduced the number of parameters needed to estimate survival probabilities and provided the basis for

fitting the continuation-ratio model (which employs a cumulative logit) used to estimate the survival probabilities directly.

Conclusion:

The fitted values from the continuation-ratio model can be used to estimate the probabilities necessary to find the expected number of accessions for a given inventory of candidates. These values provide USAREC analysts with a method to determine accession probabilities as a function of the time survived in DEP and other demographic factors. The probabilities obtained can be used to provide USAREC planners a quantitative basis for recruit accession projections needed for recruiter goal setting. While the model was applied to a specific recruit population, the modeling effort can be extended to other groups as well.

## **I. INTRODUCTION**

The United States Army Recruiting Command (USAREC) is responsible for recruiting candidates for the Army's regular and reserve enlistment programs. This thesis pertains to the recruiting process of the former. In particular, it focuses on a widely used tool in military recruiting called the Delayed Entry Program (DEP). Below we give a brief description of the program.

### **A. DELAYED ENTRY PROGRAM**

After an individual decides to join the Army and signs a contract at a Military Entrance Processing (MEP) Station, he/she does not proceed directly to basic training. The time period between the signing of the contract and the beginning of basic training is referred to as the Delayed Entry Program or DEP. DEP generally lasts from one to twelve months. The minimum of one month allows USAREC to perform the necessary administrative processing, background check and Drug and Alcohol Testing (DAT). In general, DEP acts like an inventory of recruits which can be used to smooth out the seasonal fluctuations in recruiting as well as seasonal demand in basic and advanced individual training. Moreover, DEP also allows USAREC to expand its "recruiting market" to include seniors who are still waiting to graduate from high school. After

signing enlistment contracts, these seniors are automatically placed in DEP until after graduation. While in DEP, recruits play a role in attracting candidates for enlistment programs. Recruits in DEP provide additional leads for new candidates and influence others among their peer groups to join the Army.

DEP allows recruits more career choices. While at MEP stations, recruits must meet an Army career councilor who provides them with their assignment options. By varying the length of DEP, desirable assignments may become available at some future dates. Once the desirable assignment is obtained, the counselor then reserves and, thereby, guarantees the assignment for the recruits.

However, DEP comes at a cost to USAREC. Historically, 15 percent of the recruits in DEP renege on their contract and do not access into the Army. Based on the resources spent on recruiting an individual to sign an enlistment contract, the processing cost at the MEP and the administrative cost of DEP, USAREC estimates it spends approximately \$5,000 per recruit who does not access into the Army, or a DEP loss [ Ref. 1]. This amounts to an annual cost of \$67 million that USAREC has to spend on DEP losses.

## **B. PROBLEM STATEMENT**

In an effort to reduce the cost of DEP losses, USAREC has commissioned many studies [Ref. 2-5] to analyze the factors

that affect DEP losses. More recently Burris [Ref. 1] studies DEP losses as a function of recruits contracted to be in DEP. To utilize this information in planning, he develops an optimization model to assist USAREC analyst in setting the monthly recruiting goals. In this research, we continue to work towards providing USAREC with a tool to assist in setting monthly recruiting goals.

Prior to the beginning of each quarter, USAREC analyst must set the recruiting goals for each of the next three months. These goals simply tell the recruiting brigades, battalions and stations how many individuals they need to recruit to sign enlistment contracts each month (Individuals who sign enlistment contract are simply referred to as "contracts"). When setting these recruiting goals, the analyst must consider the pool of individuals who are already in DEP. These individuals have been in DEP for various lengths of time and they are also scheduled to be sent to basic training (thereby, accessing into the Army) at different future dates. The problem that faces the analyst at this point is to determine how many individuals in the current DEP pool will eventually enter basic training and access into the Army. We can refer to these individuals as those who survive the DEP. If the expected number of survivors is small, the recruiting goals must be set higher to offset the expected losses. On the other hand, if they are higher, the goals can be adjusted downward. In the current budget environment,

there is an acute need for an accurate estimate of DEP survivors. Thus, it is the goal of this thesis to provide a methodology to estimate the number of DEP survivors. The estimate will be based on the length of time the individual has already spent in DEP, the length of time contracted to be in DEP and other pertinent demographic factors. The main focus of the thesis will be to estimate the probability of DEP survival for the largest recruiting category. This category composes of male high-school graduates with Armed Forces Qualification Test (AFQT) scores in the upper 50 percentile. However, the same methodology can be applied to other recruiting categories as well.

### C. THESIS ORGANIZATION

Chapter II gives an overview of the data set used for the research, a description of the variables used in modelling and an exploratory analysis conducted to develop the final model. In addition, contained within chapter II is a discussion of generalized linear models used for our model development. Chapter III concerns the development of the continuation-ratio model used to estimate the desired probabilities. Chapter IV gives the results of the model fit and uses of these results. Finally, Chapter V provides recommendations.

## **II. PRELIMINARY ANALYSIS**

Before attempting to model DEP survival estimates a preliminary study of the data is in order. Understanding which variables influence DEP survival and the general structure of how DEP losses occur helps develop a strategy for model development. This Chapter includes a description of the data base, justification for considering male high school graduates with AFQT scores in the upper 50th percentile apart from other recruits, and motivation for including various explanatory variables in the model. Also contained is the justification for pooling the number of losses in the middle months of contracts with a DEP of 5 or more months.

### **A. DATA BASE**

USAREC keeps extensive records on all candidates that have signed contracts. These records are contained in the Mini-master file and include a variety of information ranging from age and social security number to number of dependents and years of education. A labeling system encoding a candidates gender, AFQT score and education level is also included in the records. USAREC classifies recruits into 22 possible categories or mission boxes. Figure 1 provides the percentages of the predominantly recruited groups or mission boxes for FY 1988 through 1992. Of the mission boxes shown in



## Recruits by Mission Box

FY 1989-1992



Figure 1 RECRUITS BY MISSION BOX

Figure 1, four are male and two female groups. For the male recruits, these are GMA, graduates with mental category A (upper 50th percentile on the AFQT), SMA, high school seniors with mental category A, GMB, graduates and with mental category B (between the 32 and 50 percentile on the AFQT) and SMB, seniors with mental category B. Female mission boxes or categories are high school graduates and are classified as GFA and GFB which corresponds to graduate female mental category A and B. Burris provides a complete listing of all 22 USAREC mission boxes [Ref 1].

USAREC supplied a subset of the Mini-master database records from FY 1988 through FY 1993. Although records for FY 1993 were available, they were not used due to a significant number of open records. Recruits with open records are still in DEP and therefore the outcome of the contract not known

(loss or accessed). This is particularly true of records for recruits contracted for longer DEP periods.

To confine the scope of our model to typical DEP cases, only those records where the actual time in DEP (based on the accession or loss date) less than or equal to contracted DEP length were considered. For example, an individual with a DEP contract of 5 month with an accession or loss date in month 12 represented an unusual observation and is not considered. Records that indicate contracts of more than twelve months are not used because contracting for this length of time is not Army policy. Without this criteria for data selection the number of possible combinations becomes unmanageable. Records not used in the study comprise those that reflect unusual DEP observations or have errors in one or more of the fields. Because our study concentrates on the GMA mission box the number of records removed from the data set are summarized in Table I.

**Table I DATA SUMMARY**

YR	TOTAL RECORDS	TOTAL GMA RECORDS	GMA REC NOT USED	USED GMA RECORDS
88	131,724	34,251	775	33,476
89	136,184	34,538	1,099	33,439
90	96,941	35,331	1,055	34,276
91	86,048	37,045	821	36,244
92	59,825	22,649	570	22,079

**B. EXPLANATORY VARIABLES**

DEP length, the outcome of the contract (loss or accession) and if a loss, when it occurred are needed for the model. In addition, a set of demographic variables is included to add depth to the modelling effort. These variables are listed below in Table II and were selected with the assistance of USAREC analysts<sup>1</sup>.

**Table II SELECTION OF VARIABLES**

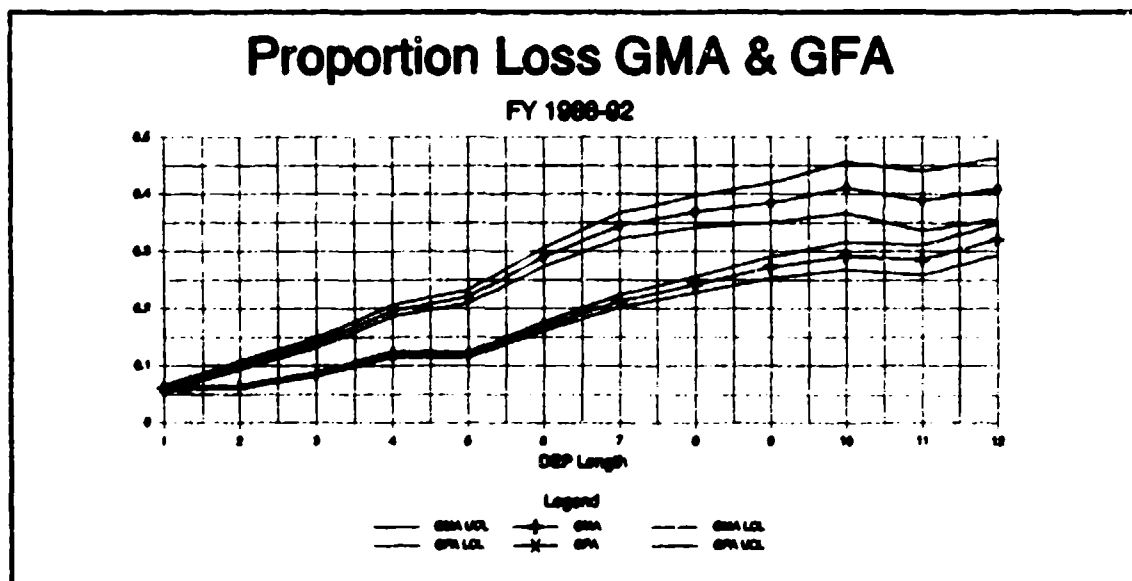
1. RACE
2. MISSION BOX
3. CHILDREN
4. MARITAL STATUS
5. RECRUITING BRIGADE

Mission box contains 22 different categories and therefore as many levels for our model. Rather than including mission

<sup>1</sup>Based on phone conversations with USAREC analysts in November 1993.

boxes an exploratory variable, our approach was to fit a single model to the GMA mission box. If all 22 levels are included in the model, the resulting model would require many estimated parameters and could prove difficult to fit. Our study therefore concentrates on GMA's.

When analyzing the data we note that GMA recruits can not be combined with other mission boxes because of the significant differences in the proportion of DEP losses between them. For instance, from Figure 2, it is clear that the proportion of DEP losses for the GFA mission box is consistently higher than for the GMA.



**Figure 2 PROP LOSSES GMA & GFA WITH 95% CONF INTERVAL**

Figures 3 and 4 graph the proportion of losses as a function of DEP length for the six recruited mission boxes.

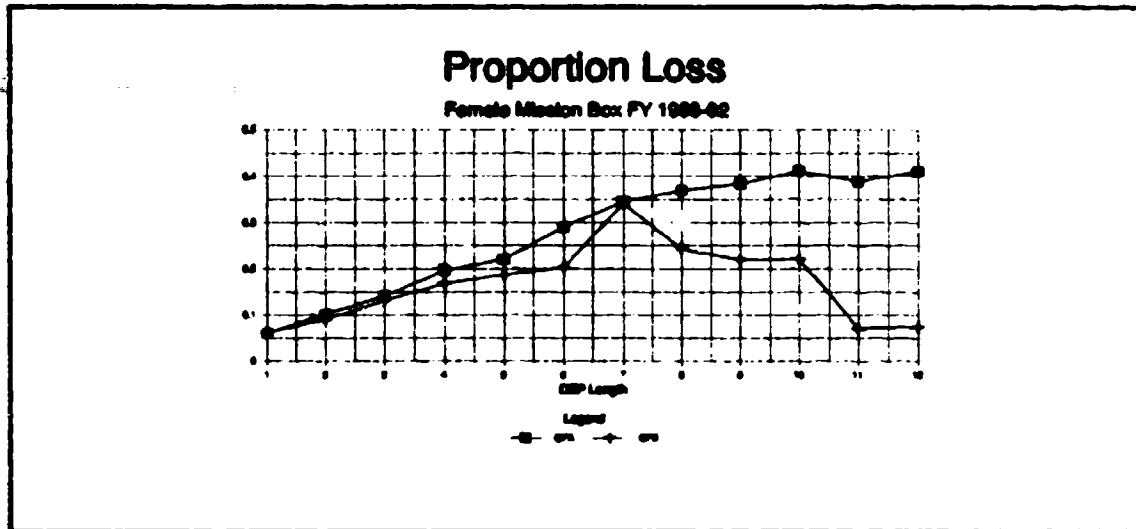


Figure 3 PROP LOSSES FOR SOME FEMALE MISSION BOXES

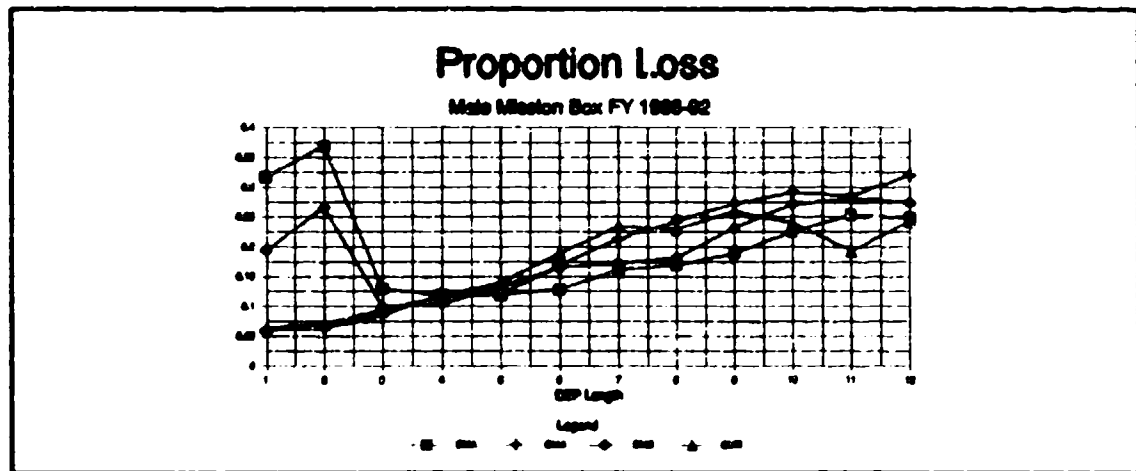


Figure 4 PROP LOSSES FOR SOME MALE MISSION BOXES

At present USAREC targets those individuals that are high school seniors or graduates and score above the 50th percentile on the AFQT. During FY 1992, nearly 37% of all candidates were GMA, the most of any recruit mission box. This is above historical percentages for all fiscal years except FY 1991 where 43 percent of recruits fell into this category. Figure 5 gives a historical summary of the percentages of

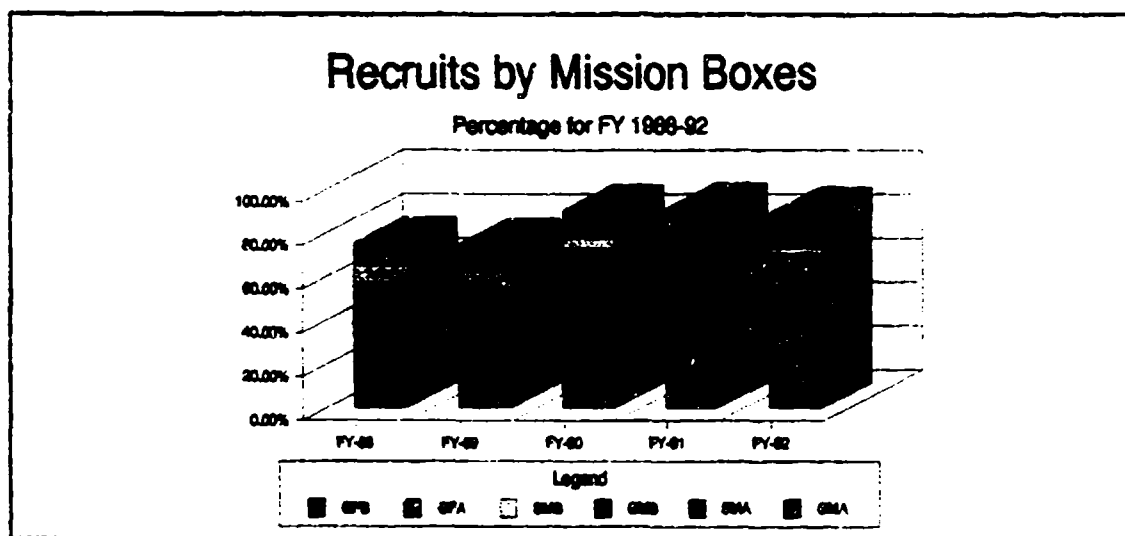


Figure 5 RECRUITS BY MISSION BOXES

recruits for 6 mission boxes for FY 1988-92 ( These account for over 80% of all recruits).

### C. INFLUENCE OF VARIABLES

Many of the studies centered on DEP loss examine individual and system characteristics believed to be associated with DEP loss [Ref. 2-5]. Cross-tabular analyses has been used to examine the relationship between many of

these characteristics. The studies have reported statistically significant differences between loss rates associated with these characteristics. Our attempt is to view the influences of the variables to be used in the model from a practical and statistical point of view.

Preliminary analysis of the variables considered in our study was conducted by obtaining the proportion of accessions for GMA's by recruiting brigade<sup>1</sup>, race and whether or not the candidate had one or more children. Formal hypothesis tests performed for differences in the proportion of accesses between groups result in significant differences. For example, from Appendix C we can obtain the necessary data to test for differences in the proportion of DEP accessions between blacks recruited from brigade I and III. This results in a test statistic of -3.03 and an associated significance level of 0.0012 . If we let  $P_1$  and  $P_2$  correspond respectively to the proportion of black recruits reported as accessions from brigade I and III, then the hypotheses tested are:

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2,$$

with test statistic:

---

<sup>1</sup> Presently USAREC has four recruiting brigades down from six. Brigades II and V have been consolidated into the other four. Candidates recruited from these brigades II and V were considered part of the other four for this study. USAREC analyst appropriately accounted for this when providing the data set.

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}} \quad (1)$$

where  $\hat{p}_1$  and  $\hat{p}_2$  are the estimated proportion of accessions and  $n_1$  and  $n_2$  are the sample sizes for the two brigades. In Table III we summarize the hypothesis tests for black recruits between recruiting brigades. All tests are significant at the 5% level of significance except for proportions between brigade I and IV.

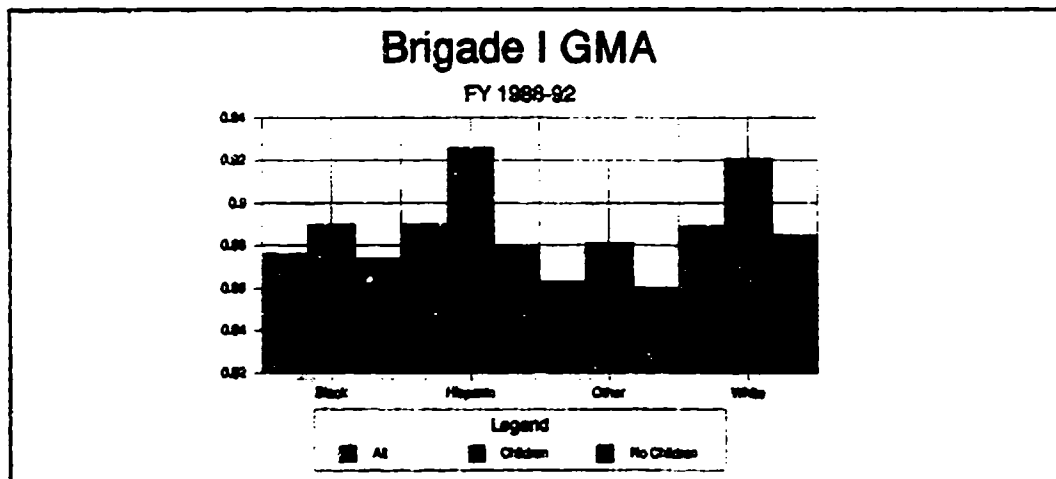
The fact that the significance level is small is due in part to the large number of observations. Tests performed on data with very large sample sizes often result in statistical significance even when there is no practical difference between the magnitudes of the proportions. Figures 6-9 are

**Table III HYPOTHESIS TEST FOR BLACK RECRUITS**

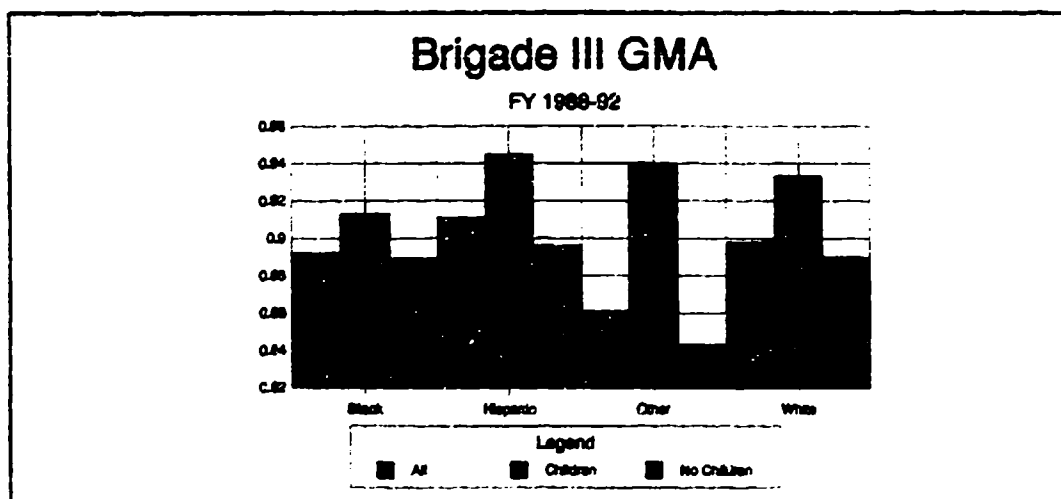
BRIG POP.		PROPORTION		SAMPLE SIZE		TEST	
1	2	$p_1$	$p_2$	$n_1$	$n_2$	Z	p-value
I	III	.876	.892	6648	7725	-3.03	.00120
I	IV	.876	.874	6648	3842	0.283	.61141
I	VI	.876	.835	6648	1624	4.009	.00005
III	IV	.892	.874	7725	3842	2.820	.00240
III	VI	.892	.835	7725	1624	5.732	0
IV	VI	.874	.835	3842	1624	3.606	.00015



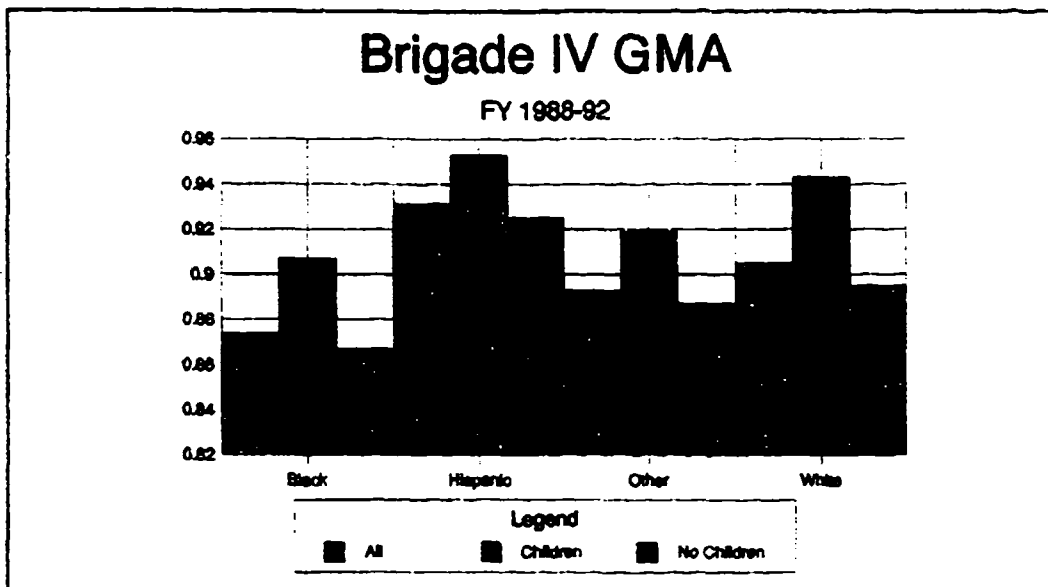
provided summarizing the results of the accession proportions. Each figure separates by brigade the accession proportions for all candidates and those with and without children. From these figures we can see there is a noticeable difference between the magnitude of the proportions. Thus, this motivates the inclusion of race, brigade, children in the model to estimate DEP accessions.



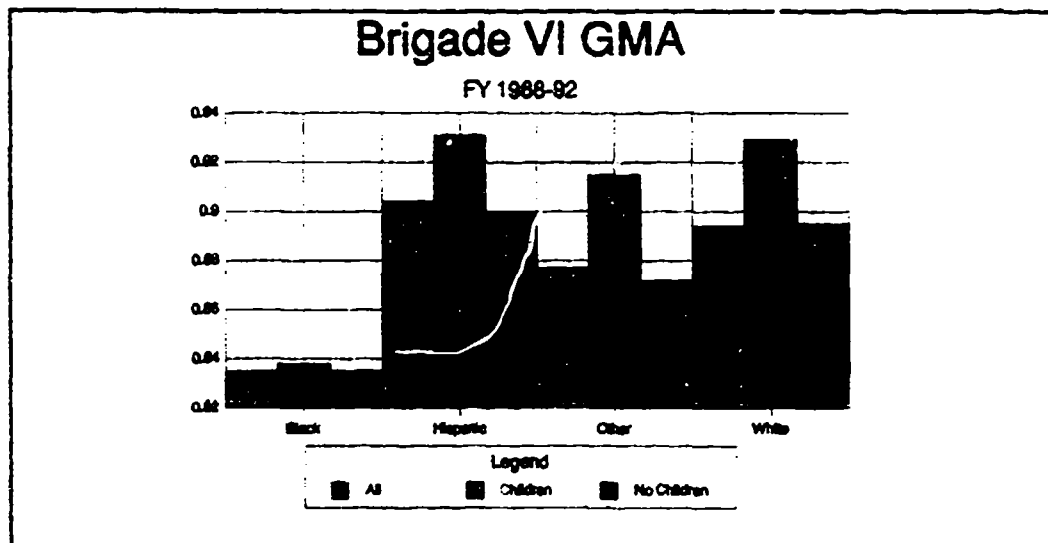
**Figure 6** PROPORTION OF GMA ACCESSIONS FOR BRIGADE I



**Figure 7** PROPORTION OF GMA ACCESSIONS FOR BRIGADE III



**Figure 8** PROPORTION OF GMA ACCESSIONS FOR BRIGADE IV



**Figure 9** PROPORTION OF GMA ACCESSIONS FOR BRIGADE VI

#### **D. EXPLANATORY ANALYSIS**

When examining how losses occur a function of contract length and time in DEP, we note that most of the losses occur late in DEP. The last months of DEP exhibit most of the losses while all other months account for relatively few. This pattern of losses is true for FY 1988 through 1992 and may be indicative of either recruits in DEP waiting to renege their contract or recruiters not reporting an individual a loss until the last minute. Table IV shows how DEP losses for all mission boxes during FY 1992 are distributed over the contract lengths for a typical year. Similar loss patterns can be seen in Appendix A for other years. The numbers contained within the table correspond to the percentage of losses incurred per month of DEP. For a one month DEP contract all losses occur in month one. From the table we see for a two month DEP, 38% of losses occur in the first month while the remainder are realized in the last month.

**Table IV DEP LOSS PERCENTAGES FY 1992 - ALL MISSION BOXES**

		LOSS MONTH											
		1	2	3	4	5	6	7	8	9	10	11	12
	1	100											
C	2	38	62										
O	3	21	18	60									
N	4	17	4	21	58								
T	5	17	2	6	21	54							
R	6	16	1	2	6	21	54						
A	7	14	1	3	3	6	26	47					
C	8	8	1	2	2	2	7	25	53				
T	9	5	0	1	1	2	6	9	26	50			
	10	3	0	0	1	1	4	7	10	30	45		
	11	3	0	0	1	1	1	4	5	8	28	50	
	12	2	1	0	0	0	0	3	5	2	10	28	49

The fact that losses occur either at the very beginning or toward the end of DEP suggest that several months could be combined together. This should result in a more parsimonious model requiring fewer estimated parameters. This notion is explored in the next section. The loglinear model discussed in the next section is used to investigate the viability of a combining months together. A family of models called generalized linear models, of which the loglinear and logit models are members, is offered next along with a discussion of the loglinear model we use in our exploratory analysis.

## **E. GENERALIZED LINEAR MODELS**

The classical linear model is of the form

$$E(Y) = \alpha + \beta'x \quad , \quad (2)$$

where  $Y$  is the response variable,  $\alpha$  is the intercept parameter,  $\beta$  is a column vector of unknown coefficients and  $x=(x_1, \dots, x_m)'$  is a vector of  $m$  explanatory variables. The response variable is assumed to have a Normal distribution with constant variance. Although this approach is fairly robust with respect to the normality assumption, there are many instances where it is not appropriate. For example, if  $Y$  is a binary variable, equation (1) can lead to an expected value  $E(Y)$  that is not between 0 and 1. Also, the variance of binary responses is not constant, but changes with the expected value of the response.

Generalized linear models (GLM) effectively address these issues. They do this by reparametertizing the model so that the expected response is a linear function of the coefficients. These models contain three parts:

1. A random component, associated with the distribution of the response variable (e.g. Binomial, Poisson, Normal). This gives the basis for the variance function used to describe how the variance change with the mean.

2. The systematic component,  $\beta'x$  which gives the linear function of the explanatory variables used for prediction.
3. The link component  $g(E(Y))$  which describes how the mean depends on the linear predictors (for Normally distributed responses the link function  $g(\cdot)$  is the identity function).

The power of the GLM approach is that when the distribution of  $Y$  belongs to an exponential family and the link function  $g(\cdot)$  is chosen appropriately (i.e.  $g(\cdot)$  is the canonical link), the Maximum Likelihood Estimators (MLE) of the parameters can be approximated using an iterative least squares algorithm. For large samples, inference for parameters of GLM's is much the same as those in the usual linear model setting.

In logistic regression, the response variable  $Y$  is binary. Let  $\pi(x)$  represent the conditional expectation of  $Y$  given a set of explanatory variables  $x = (x_1, \dots, x_p)$ ; the canonical link function in this setting is the logit function

$$\ln \left[ \frac{\pi(x)}{1-\pi(x)} \right] = \alpha + \beta'x, \quad (3)$$

where  $\beta' = (\beta_1, \dots, \beta_p)$  is the coefficient vector and  $\alpha$  is the constant intercept. Equivalently,

$$\pi(x) = \frac{e^{\alpha + \beta^T x}}{1 + e^{\alpha + \beta^T x}} \quad (4)$$

Equation (4) guarantees that the probability  $\pi(x)$  will be between 0 and 1.

When the response variable is Poisson, such as the number of counts falling into a particular cell of contingency table, then the canonical link is

$$\ln E(Y) = \alpha + \beta^T x \quad (5)$$

giving us loglinear models.

#### 1. Loglinear model

Preliminary analysis included fitting a loglinear model. We consider a candidates race (Black, Hispanic, Other, White), recruiting brigade (I,III,IV,VI) , Marital status (Single, Married), DEP length (1,...,12), DEP loss month (1,...,12) or accession in the model. The response variable for a loglinear model is the number of observations that fall into a particular cell of a contingency table defined by the variables considered.

By fitting such a model we are able to gain insight into advantageous ways to combine DEP length with DEP loss month. We defined one variable, DEP Outcome, with 90 levels and thereby consolidate two variables into one. For example, a

three month DEP has a possible outcome of a loss in first, second or third month or accession (levels 6 - 9, Table V). One can see that this arrangement results in 90 possible outcomes - 78 for losses and 12 accessions.

**Table V DEP OUTCOME MATRIX (90 LEVELS)**

		MONTH OF DEP LOSS												
		1	2	3	4	5	6	7	8	9	10	11	12	A
D E P L E N G T H	1	1												2
	2	3	4											5
	3	6	7	8										9
	4	10	11	12	13									14
	5	15	15	16	17	18								19
	6	21	22	23	24	25	26							27
	7	28	29	30	31	32	33	34						35
	8	35	37	38	39	40	41	42	43					44
	9	45	46	47	48	49	50	51	52	53				54
	10	55	56	57	58	59	60	61	62	63	64			65
	11	66	67	68	69	70	71	72	73	74	75	76		77
	12	78	79	80	81	82	83	84	85	86	87	88	89	90

NOTE: A-Accession.

The model initially fit using all 90 levels proved to be numerically unstable. This can be attributed to the sparse nature of the contingency table with relatively few counts in the "middle" months of DEP.



Several combining strategies were attempted to reduce the number of levels in DEP Outcome by joining together adjacent

**Table VI COMBINED DEP OUTCOME MATRIX (37 LEVELS)**

		MONTH OF DEP LOSS												
		1	2	3	4	5	6	7	8	9	10	11	12	A
D E P L E V E L S	1	1												2
	2	3	4											5
	3	6	7	8										9
	4	10	11	12	13									14
	5	15	15	16	17	18								19
	6	21	22	23	24	25	26							27
	7	28	29	30	31	32	33	34						35
	8	36	37	38	39	40	41	42	43					44
	9	45	46	47	48	49	50	51	52	53				54
	10	55	56	57	58	59	60	61	62	63	64			65
	11	66	67	68	69	70	71	72	73	74	75	76		77
	12	78	79	80	81	82	83	84	85	86	87	88	89	90

NOTE: L-loss; A-Accession.

cells (months) to form a composite level. Table VI indicates composite successful combining strategy. The table outlines each composite level by dashed lines. By combining the levels representing losses in the middle DEP months (that had few counts), we reduce the number of estimated parameters, bring more stability to the model and do not sacrifice model fit. In doing so we reduce the number of levels from 90 to 37. The

hypothesis test between the null model with all 90 levels and the alternative model combining levels as indicated in table VI produced a  $\chi^2$  statistic of 4420 with 4770 degrees of freedom. The associated p-value of .9998 indicates no practical difference between the fit of the model using no combining and the model combined as in Table VI. Attempts to further combine levels give models which do not fit the data as well.

A first look at the data shows which explanatory variables can not be ignored when estimating the probabilities of DEP loss. An important step to finding estimates of the DEP survival (accession) is to find the most parsimonious model for estimating these probabilities. Without it the number of parameters in any reasonably well fitting model becomes unmanageable. We do this in two ways. We restrict attention to the most heavily recruited group (GMA) and by using a loglinear model, we justify combined levels of a variable that takes into account DEP length and number of months served in DEP. This provides the basis for developing the final model used for estimating the conditional probabilities in the next Chapter.

### III. ESTIMATING CONDITIONAL PROBABILITIES

In this chapter, we estimate the conditional probability of accession given an individual has survived DEP for a certain period of time. The loglinear regression approach of the previous section gives estimates of the expected number of individuals which fall into each cell of a contingency table defined by the explanatory variables. From the loglinear model, all conditional probabilities for a set of explanatory variables could be estimated. The difficulty with using this model is that it gives the joint probability mass function of all the variables. Because we seek the conditional probabilities, the loglinear approach forces us into estimating too many parameters.

An alternative approach is to use a GLM to estimate the conditional probabilities directly. If the response variable is strictly binary, where an individual is an accession or loss, then a standard logistic regression model would apply. However, in this case the response variable  $Y$  has several levels that indicate when the individual is lost or survives DEP and becomes an accession. In addition, this variable has a sequential order to it and is therefore ordinal in nature. When the levels of an ordinal response variable are stages or time frames through which an individual, item or process may progress, such as a fixed series of attempts seeking a

success, a technique called continuation-ratio modeling is used [Ref. 8].

#### A. CONTINUATION-RATIO MODEL

In analyzing DEP survival, we use the case of a four month contract to illustrate the continuation-ratio model. We begin with a fixed number of individuals. Some of these individuals will drop out during the first, second, third or fourth month while others will access. For each individual, the response variable  $Y$  falls into one of five levels where  $Y = 1, \dots, 4$  represents a loss in month 1, month 2, month 3 and month 4 respectively. We use  $Y = 5$  to represent an accession. The continuation-ratio model uses "cumulative" or "accumulated" logits [Ref. 9] that take into account category order. Because we are ultimately interested in the probability of a recruit accessing given he survives in DEP for a number of months, we can use

$$L_j = \text{Logit}[\text{Pr}(Y > j | Y \geq j)] \quad \text{for } j = 1, \dots, 4 \quad (6)$$

For instance, in the context of our example,  $L_2$  is the logit of probability of surviving past the second month given survival of two or more months. An alternative expression for  $L_j$  is

$$L_j = - \ln \left[ \frac{\text{Pr}(Y > j)}{1 - \text{Pr}(Y \leq j)} \right] \quad (7)$$

The continuation-ratio model is similar to Cox's proportional hazard model and approaches it as the number of stages increases [Ref. 8].

In the continuation-ratio model explanatory variables are incorporated by letting

$$L_j = \alpha + \beta'X , \quad (8)$$

where  $\alpha$  is the intercept,  $\beta'$  is the vector of unknown coefficients and  $X$  is a vector of explanatory variables. Using the continuation-ratio model we estimate the conditional probability  $P(Y > j | Y \geq j)$  for  $j = 1, \dots, 4$ . We can now estimate the probability of accession given the recruit survives for a number of months in DEP (i.e.  $P(Y > 4 | Y \geq j)$  for  $j = 1, \dots, 4$ ).

#### B. THE MODEL CONSTRUCTION PROCESS

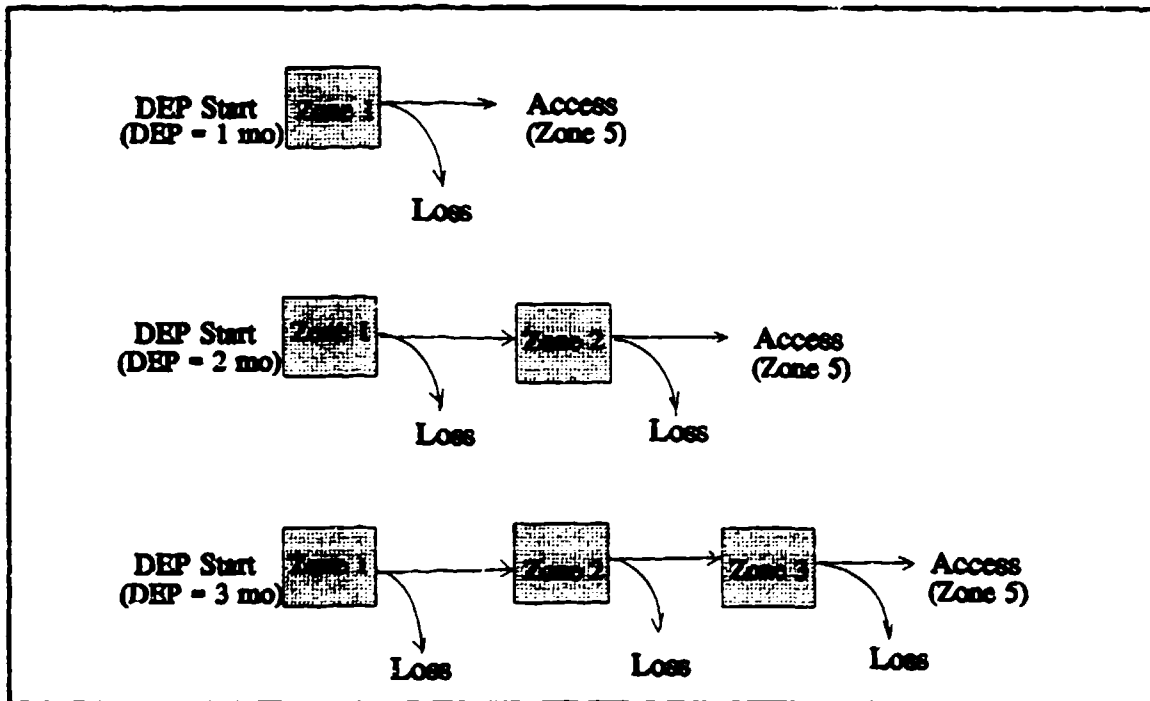
S-PLUS version 3.1, by Statistical Science, Incorporated was used on a Hewlett Packard 730 work station to fit the model. The exploratory variables are the same as those previously used for the loglinear model discussed in Chapter II. In addition, we establish an ordinal variable, Zone, that takes into account the strategy for combining months successfully exploited for the loglinear model. Table VII itemizes these and their associated levels.

**Table VII LIST OF CONTINUATION-RATIO MODEL VARIABLES**

EXPLANATORY VARIABLE	SYMBOL	LEVELS	TYPE
DEP CONTRACT	D	1,2,...,12	ORDINAL
ZONE	Z	1,...,5	ORDINAL
MARITAL STATUS	M	MARRIED, SINGLE (1,2)	CATEGORICAL
RACE	R	BLACK,HISPANIC, OTHER, WHITE (1,...,4)	CATEGORICAL
CHILDREN	C	YES,NO (1,2)	CATEGORICAL
BRIGADE	B	I, III, IV, VI (1,...,4)	CATEGORICAL

Zone represents the stages through which a recruit must survive to become an accession. The number of zones vary with the length of contract. For all DEP lengths, reaching zone 5 represents an accession while zone 1 represents the first month of contract. A one month DEP has two levels; zone 1 for a loss and zone 5 for an accession (Figure 10). Three levels exist for a two month contract where losses can occur in either the first or second month represented by zone 1 and 2. Similarly, an accession is labeled as zone 5. A three month contract accordingly calls for 4 levels with losses possible in zones 1 through 3. Finally, for DEP lengths of 4 or more months 5 levels are needed. Zone 2 for DEP lengths greater than 4 months is a composite of all "middle" months. The

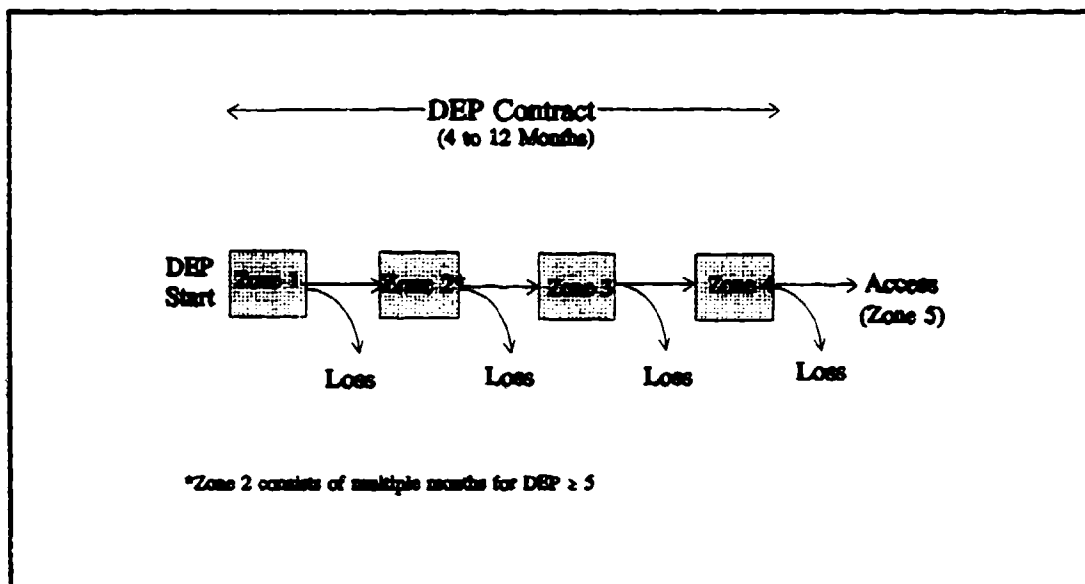
extent to which these "middle" months are combined into zone 2 will vary according to the length of DEP. Zone 2 will consist of all months but the first, last and next to last for



**Figure 10 ZONE PROFILE FOR 1, 2 AND 3 MONTH DEP**

contracts of 4 or more months. Figure 11 summarizes the zones for contracts greater than 3 months.

Combining months into zones as motivated by our loglinear model reduces the number of cells in the contingency table defined by the variables to 2688. Accordingly, the estimated parameters for the model are reduced.



**Figure 11 ZONE PROFILE FOR DEP ≥ 4 MONTHS**

### **C. FITTING**

S-PLUS glm function with a binomial link component was used to run the model. Recall, for GLM models, the link component (p.19) describes how the mean of the response variable depends on the linear predictors. Since we are using a logit model the binomial link is appropriate.

Our assessment of model adequacy was centered on the deviance explained by the model. Based on the outcome of the goodness-of-fit test terms were added or removed while keeping with the discipline of hierarchical models. Our model was kept hierarchical, where all lower-order terms are included if they involve those in higher-order. Because our model consists of no more than two-way interactions between



exploratory variables, keeping a model hierarchical requires the main effects to be kept for any two way interactions in which they appear.

In linear regression, summary measures of the distance between the observed and fitted values are a function of the residual defined as the difference between the fitted and observed value. In logistic regression, there are several possible measures of the fitted and observed values. The residual deviance  $D$  is one of these measures and is a most reliable and routinely used measure. The deviance is  $-2$  times the difference of the log-likelihood of the fitted and saturated models. Under the null hypothesis that a model fits and when the sample size is large,  $D$  has an approximately  $\chi^2$  distribution with  $u$  degrees of freedom equal to the number of observations  $N$  less the number of parameters  $p$ . Therefore, if the model fit is good, asymptotically the expected deviance is  $N-p$ .

In logistic models with many  $\pi(x_i)$ 's very close to zero or, as in our case, close to one, the distribution of the deviance is not close to being  $\chi^2$  with  $N-p$  degrees of freedom. Instead  $D$  tends to be much smaller than  $N-p$ . Thus, when using  $D$  our overall test of model fit results in very large  $p$ -values whether the models fit or not. The asymptotic distributions do hold for testing between two nested models. Specifically, the test statistic of  $H_0$ : model 1 versus  $H_a$ : model 2 is  $D_1 - D_2$  which is asymptotically  $\chi^2$  with  $u_1 - u_2$  degrees of freedom.

Here  $D_1$  and  $D_2$  are the total deviance of model 1 and 2 while  $v_1$  and  $v_2$  correspond to each of the model's residual degree of freedom.

In linear regression, a way to measure the contribution of an independent variable toward predicting a dependant variable is by calculating the coefficient of determination ( $R^2$ ). This coefficient takes values between 0 and 1 with a high value suggesting a good fit. Because logit models have binary dependent variables, they have low  $R^2$  values regardless of how well they fit [Ref. 10]. A method analogous to the coefficient of determination that avoids the problem with binary dependent variables is the likelihood ratio index [Ref 10]. This index provides a measure of the ratio of explained deviation in the model and is defined as:

$$\rho = 1 - \frac{\text{Explained Deviance}}{\text{Total Deviance}} \quad (9)$$

Where the total deviance is the deviance from fitting the logit model with only a constant term (no explanatory variables).

#### D. FINAL MODEL

In the final model, the logit of the probability of surviving zone  $j$  given survival up to zone  $j$  can be parameterized as

$$L_j = \alpha + \beta_j^z + \beta_i^D + \beta_k^M + \beta_l^R + \beta_m^B + \beta_{ij}^{Dz} . \quad (10)$$

Here  $\beta_j^z$   $j = 1, \dots, 4$  are the parameters corresponding to zones 1 through 4,  $\beta_i^D$  for  $i = 1, \dots, 12$  are the parameters for DEP of 1 to 12 months,  $\beta_k^M$   $k = 1, 2$  are the parameters corresponding to the marital status married and single respectively,  $\beta_l^R$   $l = 1, \dots, 4$  are the parameters corresponding to the respective races, black, hispanic, other and white and  $\beta_m^B$   $m = 1, \dots, 4$  are the parameters corresponding to the brigades I, III, IV, VI respectively. Finally, the two - way interaction parameters between zone and DEP length are  $\beta_{ij}^{Dz}$  for  $i = 1, \dots, 12$ ;  $j = 1, \dots, 4$ . This model is simple and fits the data well by explaining 87% of the total deviance (Table VIII).

**Table VIII REVIEW OF MODELS**

MODEL	RESIDUAL DEVIANCES	RESIDUAL DF	Q
Null	16,616	2,687	0
Main Effects	3,148	2,114	.82
Final	2,053	2,088	.87
Main Effects with Two Way Interactions	1,654	1,953	.99

A model using all main effects and two-way interactions provides a nearly perfect fit. However, our aim was to obtain the best fit with the fewest possible parameters. To this end, the model was simplified to include only DEP length and zone as a two-way interaction term. The analysis of deviance given Table IX provides a summary of the deviances for the final fitted model. In it is summarized the contribution each of the terms makes toward the final model fit. The 87% of the total deviance explained and a  $\chi^2$  goodness-of-fit significance level of .6814 associated with 2088 total deviance and 2057 degrees of freedom provides an adequate fit to calculate the probabilities we need.

**Table IX ANALYSIS OF DEVIANCE FOR FITTED MODEL**

TERMS	DF	DEV	RESID DF	RESID DEV	p	SIGNIF
NULL			2687	16616	0	.000
DEP LENGTH	562	1844	2125	14771	.11	.000
ZONE	3	11114	2122	3658	.77	.000
MARRIED	1	360	2121	3298	.80	.000
RACE	3	124	2118	3174	.81	.000
BRIGADE	3	16	2115	3158	.82	.001
DEP LENGTH:ZONE	27	1101	2088	2057	.87	.000

Plots of residual deviance are often used in regression modelling to check a model's adequacy. We note that with the large number of cases where  $\pi(x_i)$  is nearly one, plots of standardized residuals to investigate model adequacy are of small help. In fact, all these plots reveal, is for the given data the estimated proportions are near one. For this reason we do not use plots of standardized residuals here.

In this chapter we use the continuation-ratio model to estimate conditional probabilities directly. The fitted values allow us to directly calculate probabilities we ultimately desire. The final model is simple and explains most of the total deviance.

#### IV. MODEL RESULTS

The fitted continuation-ratio model for GMA's provide the values needed to estimate the expected probability of accessions given a certain survival has occurred. To illustrate, take the case of fitted values obtained by the model for MARRIED, BLACK and BRIGADE I (Table X). The fitted values indicate a single, black male recruited from brigade I has a 95% chance of surviving the first month and thereby

**Table X  $P(x > \text{zone } i | x \geq \text{zone } 1)$  FITTED VALUES FOR BLACK, MARRIED, BRIGADE I**

Conditional Probability of Surviving Past Zone (i)					
D E P	Z O N E				
		1	2	3	4
	1	.9502			
	2	.9782	.9607		
	3	.9826	.9903	.9456	
	4	.9832	.9964	.9822	.9246
	5	.9861	.9948	.9817	.9183
	6	.9897	.9883	.9727	.8782
	7	.988	.9853	.9659	.8434
	8	.9923	.9719	.9593	.8289
	9	.9932	.9694	.9471	.8029
	10	.995	.9612	.9471	.7881
	11	.9946	.9689	.9528	.7756
	12	.9942	.9516	.9531	.8102

accessing into the Army under a one month DEP contract. A similar recruit with a DEP of 10 months has a 99.5% chance of surviving past the initial month of DEP, a 96.1% chance of surviving past months 2 through 8 (zone 2) and a 94.7% chance of making it past the next to last month of the contract. Meanwhile, there exist a 78.8% chance of making it past the last month and thereby accessing. A complete set of fitted probabilities is included in Appendix E.

#### A. CONDITIONAL PROBABILITIES

The probability an individual X survives past zone 4,

$$Pr(X > \text{Zone 4}) \quad (11)$$

can be expressed as a function of conditional probabilities of surviving previous zones. In other words, the probability of surviving past zone 4 and becoming an accession is the probability of surviving past zone 4 given the individual survived past zone 3 multiplied by the probability of surviving past zone 3. Equation 11 is equivalent to

$$Pr(X > \text{Zone 4} | X > \text{Zone 3}) Pr(X > \text{Zone 3}) \quad (12)$$

In general terms for  $i=2, \dots, 4$

$$P(X > \text{zone } i) = Pr(X > \text{zone } i | X > \text{zone } i-1) Pr(X > \text{zone } i-1) \quad (13)$$

From Table XI we can obtain the probability of accession (surviving zone 4) given an individual has survived past some time. For example, the probability of an individual accessing given he has survived past zone 2 is:

$$\Pr( X > \text{zone 4} | X > \text{zone 3}) \Pr( X > \text{zone 3} | X > \text{zone 2}).$$

Thus from Table XI the estimated probability is  $0.74641 = (0.7881)(0.9471)$ . Therefore, a married, black male, recruited from brigade I under a 10 month contract who has survived past zone 2 is expected to access 74.6% of the time. Table XI contains the estimated probability of surviving DEP conditioned on time survived. The value of .7468 calculated above is accordingly listed with a 10 month contract and under zone 3. Notice in Table XI all numbers increase from left to right. This should be the case since the more a recruit survives the more apt he is to access. A complete listing of all fitted values and their appropriate conditional probability is provided in Appendix E.



**Table XI CONDITIONAL PROBABILITIES FOR TABLE XI**

Prob. of Accession Given Survived Zone (i-1)					
D E P	Z O N E				
		1	2	3	4
	1	.9502			
	2	.93976	.9607		
	3	.92013	.93643	.9456	
	4	.88967	.90487	.90814	.9246
	5	.88434	.89681	.9015	.9183
	6	.83554	.84423	.85423	.8782
	7	.79303	.80266	.81464	.8434
	8	.76687	.77282	.79516	.8289
	9	.73214	.73716	.76043	.8029
	10	.71386	.71745	.74641	.7881
	11	.71214	.71601	.73899	.7756
	12	.73057	.73483	.77220	.8102

#### **B. USING PROBABILITIES TO ESTIMATE ACCESSIONS**

USAREC planners may use the conditional probabilities to estimate accessions at some future date. By multiplying the appropriate conditional probability by the number of recruits in a given category a point estimate of the number of anticipated accessions is obtained. To illustrate, we borrow

from table XI discussed in the previous section and use a simple example. If we have 100 single, black males recruited from brigade I. Of the 100 recruits, 50 have signed 6 month contracts and the rest are under 9 month DEP. Assume that of the 50 recruits in each contract group, 13 are in zone 1 and 13 are in zone 4. Of the remainder, 12 are in zone 2 and 12 in zone 3. To estimate the number accessing at some future date we multiply the number of individuals in DEP by their associated conditional probability. Table XII provides the results of our example. In similar fashion, if we desired to

**Table XII ESTIMATING ACCESSIONS**

Cont Length	Prob	Number in DEP	Product	Expected accessions
6	.8355	13	10.68	11 in 6 months
6	.8442	12	10.13	10 in 2 to 4 months
6	.8542	12	10.25	10 next month
6	.8782	13	11.41	11 this month
9	.7321	13	9.53	10 in 9 months
9	.7371	12	8.846	9 in 2 to 7 months
9	.7604	12	9.125	9 next month
9	.8029	13	10.4838	10 this month

estimate the number of accessions in one month, we would multiply the total number of recruits with a projected accession date for next month by the appropriate last zone conditional probability. Thus, next months estimates are obtained.

## **V. FINAL SUMMARY**

The unique structure of DEP losses necessitates exploring avenues to address the modelling challenge associated with sparse contingency table. The use of the loglinear model to explore viable strategies for combining levels and thereby reducing the size of the contingency table (increasing the cell counts) is valuable toward this end. We note that the sparsity of the contingency table may be largely due to the inherent nature of the DEP loss reporting process or to a recruit's hesitation to renege on his contract early on. Recruiters are reluctant to report a candidate as a loss until no doubt exists of the individuals intention to renege on the contract. Recruits, on the other hand, may feel compelled to rescind only at the very end of the DEP. Despite this, a loss can only be realized when it is reported. Without major policy changes the actual loss date may never be available.

### **A. CONCLUSIONS AND RECOMMENDATIONS**

The model building effort provides a methodology to estimate probabilities of accession based on time survived in DEP. The probabilities can provide USAREC planners a quantitative basis for accession projections for GMA recruits. By entering the model's fitted values into a commercial spreadsheet or database USAREC analysts can quickly estimate

recruit accession numbers at some future date based on the present DEP inventory. By applying this modelling methodology to the other recruit categories (mission boxes) a complete analysis tool can be obtained. In doing so, a means to estimate recruit accessions may be realized which can ultimately assist in setting recruiter goals.

**APPENDIX A: LOSS PERCENT AND PROPORTIONS (ALL MISSION BOXES)**

Loss Probability YR 1988														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	acc
	mo1	0.059												0.941
	mo2	0.042	0.058											0.9
C	mo3	0.027	0.028	0.061										0.884
e	mo4	0.024	0.006	0.028	0.081									0.861
n	mo5	0.015	0.003	0.005	0.028	0.094								0.854
t	mo6	0.009	9E-04	0.002	0.008	0.035	0.123							0.823
r	mo7	0.008	0.001	0.002	0.003	0.008	0.039	0.123						0.816
a	mo8	0.01	5E-04	0.001	0.001	0.004	0.007	0.032	0.125					0.82
c	mo9	0.009	0.001	0.001	0.001	0.001	0.003	0.009	0.04	0.128				0.807
t	mo10	0.009	3E-04	5E-04	0.001	0.001	0.002	0.007	0.012	0.042	0.153			0.772
	mo11	0.009	0.002	2E-04	0	1E-03	7E-04	0.002	0.005	0.011	0.041	0.179		0.75
	mo12	0.01	9E-04	5E-04	3E-04	5E-04	5E-04	0.002	0.002	0.004	0.01	0.047	0.195	0.727
Percent of Loss YR 1988														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1	100%												
	mo2	42%	58%											
C	mo3	23%	24%	53%										
e	mo4	17%	4%	20%	58%									
n	mo5	11%	2%	3%	19%	65%								
t	mo6	5%	1%	1%	5%	19%	69%							
r	mo7	4%	1%	1%	1%	5%	21%	67%						
a	mo8	6%	0%	1%	1%	2%	4%	18%	69%					
c	mo9	4%	1%	1%	1%	1%	1%	4%	21%	66%				
t	mo10	4%	0%	0%	0%	1%	1%	3%	5%	19%	67%			
	mo11	4%	1%	0%	0%	0%	0%	1%	2%	5%	16%	71%		
	mo12	4%	0%	0%	0%	0%	0%	1%	1%	1%	4%	17%	71%	
Prob( DEP Loss in month i   Survived to month i - 1) for YR 1988														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1													
	mo2	0.061												
C	mo3	0.091	0.064											
e	mo4	0.118	0.098	0.075										
n	mo5	0.132	0.13	0.125	0.099									
t	mo6	0.17	0.17	0.168	0.161	0.13								
r	mo7	0.177	0.177	0.175	0.173	0.166	0.131							
a	mo8	0.172	0.171	0.17	0.169	0.166	0.16	0.132						
c	mo9	0.186	0.184	0.183	0.183	0.182	0.179	0.172	0.137					
t	mo10	0.221	0.221	0.221	0.22	0.219	0.217	0.212	0.202	0.165				
	mo11	0.243	0.242	0.241	0.241	0.241	0.24	0.239	0.235	0.226	0.192			
	mo12	0.265	0.265	0.264	0.264	0.264	0.263	0.262	0.26	0.257	0.249	0.211		

**APPENDIX A: LOSS PERCENT AND PROPORTIONS (ALL MISSION BOXES)**

Loss Probability YR 1989														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	acc
	mo1	0.073												0.927
	mo2	0.029	0.036											0.935
C	mo3	0.021	0.007	0.059										0.913
o	mo4	0.018	0.003	0.014	0.088									0.878
a	mo5	0.016	0.001	0.005	0.023	0.102								0.853
t	mo6	0.011	9E-04	0.003	0.012	0.036	0.116							0.821
r	mo7	0.014	0.001	8E-04	0.012	0.014	0.025	0.11						0.822
a	mo8	0.009	7E-04	0.001	0.025	0.033	0.019	0.026	0.087					0.8
c	mo9	0.007	2E-04	0.002	0.017	0.048	0.058	0.026	0.022	0.094				0.726
t	mo10	0.007	8E-04	4E-04	0.003	0.028	0.038	0.059	0.026	0.025	0.086			0.726
	mo11	0.007	2E-04	0	0.001	0.003	0.011	0.028	0.073	0.056	0.027	0.087		0.70
	mo12	0.005	0.001	0.001	0.001	0.002	0.002	0.007	0.02	0.063	0.094	0.031	0.087	0.686
Percent of Loss YR 1989														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1	100%												
	mo2	45%	55%											
C	mo3	24%	8%	68%										
o	mo4	14%	2%	11%	72%									
a	mo5	11%	1%	3%	15%	69%								
t	mo6	6%	0%	2%	7%	20%	67%							
r	mo7	8%	1%	0%	7%	8%	14%	62%						
a	mo8	4%	0%	1%	12%	17%	9%	13%	44%					
c	mo9	2%	0%	1%	6%	17%	21%	10%	8%	34%				
t	mo10	3%	0%	0%	1%	10%	14%	22%	10%	9%	32%			
	mo11	2%	0%	0%	0%	1%	4%	10%	25%	18%	9%	30%		
	mo12	2%	0%	0%	0%	1%	1%	2%	6%	20%	30%	10%	26%	
Prob( DEP Loss in month i   Survived to month i - 1) for YR 1989														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1													
	mo2	0.037												
C	mo3	0.068	0.061											
o	mo4	0.106	0.092	0.081										
a	mo5	0.132	0.131	0.127	0.106									
t	mo6	0.169	0.169	0.166	0.156	0.123								
r	mo7	0.166	0.165	0.165	0.154	0.141	0.118							
a	mo8	0.193	0.193	0.191	0.171	0.141	0.124	0.099						
c	mo9	0.269	0.269	0.267	0.254	0.218	0.165	0.138	0.115					
t	mo10	0.269	0.268	0.268	0.266	0.244	0.213	0.159	0.133	0.106				
	mo11	0.289	0.288	0.288	0.287	0.266	0.277	0.256	0.194	0.139	0.11			
	mo12	0.31	0.31	0.309	0.308	0.307	0.305	0.301	0.286	0.236	0.147	0.113		

**APPENDIX A: LOSS PERCENT AND PROPORTIONS (ALL MISSION BOXES)**

Loss Probability YR 1990														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	acc
	mo1	0.049												0.951
	mo2	0.022	0.05											0.928
C	mo3	0.017	0.019	0.073										0.891
e	mo4	0.015	0.008	0.038	0.082									0.857
a	mo5	0.018	0.007	0.011	0.025	0.106								0.835
r	mo6	0.018	0.017	0.013	0.008	0.026	0.122							0.798
a	mo7	0.01	0.014	0.021	0.008	0.004	0.034	0.127						0.785
e	mo8	0.008	0.002	0.025	0.01	0.002	0.007	0.032	0.123					0.793
c	mo9	0.005	7E-04	0.004	0.004	0.002	0.009	0.018	0.057	0.134				0.768
t	mo10	0.003	8E-04	4E-04	4E-04	0.002	0.005	0.014	0.022	0.053	0.148			0.752
	mo11	0.004	4E-04	0	4E-04	0	0.001	0.009	0.011	0.021	0.064	0.156		0.733
	mo12	0.003	6E-04	6E-04	6E-04	2E-04	0	0.001	0.003	0.012	0.028	0.059	0.152	0.74
Percent of Loss YR 1990														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1	100%												
	mo2	31%	69%											
C	mo3	16%	18%	67%										
e	mo4	10%	5%	27%	57%									
a	mo5	10%	5%	6%	15%	64%								
t	mo6	8%	8%	6%	4%	13%	61%							
r	mo7	4%	7%	10%	3%	2%	16%	59%						
a	mo8	3%	1%	12%	5%	1%	3%	15%	59%					
c	mo9	2%	0%	2%	2%	1%	4%	7%	24%	58%				
t	mo10	1%	0%	0%	0%	1%	2%	5%	8%	21%	60%			
	mo11	1%	0%	0%	0%	0%	1%	3%	4%	8%	24%	58%		
	mo12	1%	0%	0%	0%	0%	0%	0%	1%	5%	11%	23%	58%	
Prob( DEP Loss in month i   Survived to month i - 1) for YR 1990														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1													
	mo2	0.051												
C	mo3	0.084	0.078											
e	mo4	0.13	0.107	0.078										
a	mo5	0.151	0.145	0.135	0.113									
t	mo6	0.189	0.175	0.163	0.157	0.133								
r	mo7	0.207	0.198	0.178	0.173	0.17	0.139							
a	mo8	0.203	0.201	0.18	0.171	0.169	0.163	0.134						
c	mo9	0.228	0.227	0.224	0.221	0.219	0.212	0.199	0.149					
t	mo10	0.248	0.245	0.245	0.245	0.243	0.24	0.229	0.211	0.165				
	mo11	0.264	0.264	0.264	0.264	0.264	0.263	0.256	0.248	0.231	0.175			
	mo12	0.259	0.258	0.258	0.257	0.257	0.257	0.256	0.254	0.244	0.222	0.17		



**APPENDIX A: LOSS PERCENT AND PROPORTIONS (ALL MISSION BOXES)**

Loss Probability YR 1991														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	acc
	mo1	0.058												0.942
	mo2	0.049	0.041											0.91
C	mo3	0.023	0.04	0.07										0.867
o	mo4	0.014	0.006	0.04	0.09									0.85
n	mo5	0.012	0.001	0.006	0.041	0.071								0.869
t	mo6	0.009	0.001	0.003	0.01	0.065	0.071							0.841
r	mo7	0.015	0.001	0.001	0.009	0.018	0.084	0.121						0.752
a	mo8	0.011	3E-04	0	0.005	0.012	0.017	0.077	0.113					0.765
c	mo9	0.01	9E-04	0	0.004	0.007	0.006	0.018	0.08	0.068				0.777
t	mo10	0.02	0	0	0.003	0.008	0.008	0.015	0.018	0.103	0.145			0.68
	mo11	0.006	5E-04	8E-04	8E-04	5E-04	0.008	0.008	0.017	0.028	0.068	0.115		0.747
	mo12	0.005	6E-04	0.001	2E-04	0.001	0.001	0.003	0.006	0.018	0.033	0.059	0.095	0.776
Percent of Loss YR 1991														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1	100%												
	mo2	54%	48%											
C	mo3	17%	30%	52%										
o	mo4	9%	4%	27%	60%									
n	mo5	9%	1%	5%	31%	54%								
t	mo6	6%	1%	2%	6%	41%	45%							
r	mo7	6%	1%	0%	4%	7%	34%	49%						
a	mo8	5%	0%	0%	2%	5%	7%	33%	48%					
c	mo9	4%	0%	0%	2%	3%	3%	8%	36%	44%				
t	mo10	6%	0%	0%	1%	2%	3%	5%	6%	32%	45%			
	mo11	2%	0%	0%	0%	0%	3%	3%	7%	11%	27%	46%		
	mo12	2%	0%	1%	0%	0%	1%	1%	3%	8%	15%	26%	43%	
Prob( DEP Loss in month i   Survived to month i - 1) for YR 1991														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1													
	mo2	0.044												
C	mo3	0.112	0.074											
o	mo4	0.138	0.115	0.083										
n	mo5	0.121	0.119	0.114	0.075									
t	mo6	0.161	0.15	0.147	0.139	0.078								
r	mo7	0.237	0.236	0.235	0.229	0.214	0.138							
a	mo8	0.227	0.228	0.226	0.222	0.213	0.199	0.129						
c	mo9	0.215	0.214	0.214	0.212	0.206	0.201	0.186	0.112					
t	mo10	0.306	0.306	0.306	0.304	0.299	0.292	0.282	0.267	0.176				
	mo11	0.249	0.248	0.248	0.247	0.247	0.241	0.234	0.22	0.197	0.134			
	mo12	0.22	0.22	0.219	0.219	0.218	0.217	0.215	0.209	0.195	0.186	0.109		

**APPENDIX A: LOSS PERCENT AND PROPORTIONS (ALL MISSION BOXES)**

Loss Probability YR 1992														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	acc
	mo1	0.088												0.934
	mo2	0.028	0.046											0.926
C	mo3	0.022	0.019	0.083										0.896
e	mo4	0.025	0.006	0.031	0.085									0.853
n	mo5	0.029	0.003	0.009	0.036	0.091								0.832
t	mo6	0.032	0.002	0.005	0.013	0.043	0.109							0.797
r	mo7	0.032	0.003	0.006	0.006	0.014	0.06	0.106						0.773
a	mo8	0.017	0.001	0.004	0.005	0.005	0.016	0.056	0.119					0.777
c	mo9	0.013	8E-04	0.002	0.002	0.005	0.015	0.022	0.062	0.121				0.758
t	mo10	0.006	3E-04	9E-04	0.001	0.002	0.009	0.016	0.023	0.069	0.104			0.768
	mo11	0.007	6E-04	0	0.002	0.001	0.003	0.01	0.012	0.019	0.07	0.124		0.751
	mo12	0.003	0.002	0	0	0	7E-04	0.005	0.01	0.004	0.018	0.052	0.093	0.811
Percent of Loss YR 1992														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1	100%												
	mo2	38%	62%											
C	mo3	21%	18%	60%										
e	mo4	17%	4%	21%	58%									
n	mo5	17%	2%	6%	21%	54%								
t	mo6	16%	1%	2%	6%	21%	54%							
r	mo7	14%	1%	3%	3%	6%	26%	47%						
a	mo8	8%	1%	2%	2%	2%	7%	25%	53%					
c	mo9	5%	0%	1%	1%	2%	6%	9%	26%	50%				
t	mo10	3%	0%	0%	1%	1%	4%	7%	10%	30%	45%			
	mo11	3%	0%	0%	1%	1%	1%	4%	5%	8%	28%	50%	0%	
	mo12	2%	1%	0%	0%	0%	0%	3%	5%	2%	10%	28%	49%	
Prob( DEP Loss in month i   Survived to month i - 1) for YR 1992														
		mo1	mo2	mo3	mo4	mo5	mo6	mo7	mo8	mo9	mo10	mo11	mo12	
	mo1													
	mo2	0.047												
C	mo3	0.084	0.066											
e	mo4	0.125	0.104	0.078										
n	mo5	0.143	0.14	0.132	0.098									
t	mo6	0.177	0.176	0.172	0.16	0.12								
r	mo7	0.202	0.199	0.194	0.189	0.177	0.121							
a	mo8	0.21	0.209	0.205	0.201	0.197	0.184	0.133						
c	mo9	0.232	0.231	0.23	0.228	0.224	0.212	0.194	0.137					
t	mo10	0.227	0.227	0.226	0.225	0.223	0.216	0.203	0.184	0.12				
	mo11	0.243	0.243	0.243	0.241	0.24	0.238	0.23	0.221	0.205	0.142			
	mo12	0.186	0.184	0.184	0.184	0.184	0.184	0.18	0.171	0.168	0.152	0.103		

APPENDIX B: FY-1988-92 PROP LOSS FOR MAJOR MISSION BOXES

BOX I (SMA)

DEP	1988			1989			1990			1991			1992			TOTAL			95% C	
	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Upper	Lower
1	105	110	0.0000	66	10	0.1280	14	0	0	12	0	0	70	8	0.0700	271	125	0.3174	0.3941	0.2707
2	194	407	0.8772	162	21	0.1146	71	6	0.0860	48	6	0.1111	310	24	0.0700	708	468	0.3008	0.3609	0.2414
3	274	122	0.3001	406	52	0.0727	227	21	0.0947	136	12	0.0780	606	70	0.0828	1708	257	0.129	0.144	0.1136
4	444	50	0.1012	702	75	0.0905	310	39	0.1117	491	85	0.1602	719	105	0.1294	2050	354	0.1178	0.1266	0.1091
5	1391	148	0.0908	1157	118	0.094	434	61	0.1004	1612	257	0.1242	1862	224	0.1421	5108	808	0.1194	0.1272	0.1116
6	1351	162	0.1071	1254	182	0.1144	1318	298	0.1894	1220	157	0.114	708	148	0.1894	3952	872	0.1282	0.1869	0.1201
7	1638	227	0.1286	1794	282	0.1605	2213	465	0.1626	859	172	0.1666	828	144	0.2100	3657	1350	0.1612	0.1694	0.1691
8	2822	451	0.1488	2394	488	0.178	3802	711	0.1917	1604	302	0.177	972	181	0.1871	10494	2183	0.1691	0.1757	0.1624
9	2537	460	0.158	1038	591	0.3323	1794	446	0.1891	306	150	0.142	872	110	0.2252	7652	1768	0.1888	0.1974	0.1812
10	1708	382	0.1824	1800	601	0.2508	1281	589	0.2384	580	222	0.2852	845	218	0.2078	6154	1788	0.2288	0.235	0.2162
11	1804	507	0.2194	1898	612	0.2808	1457	519	0.2518	2511	849	0.2518	708	252	0.2825	5048	2788	0.2585	0.2619	0.2461
12	2880	1072	0.2868	2274	882	0.2917	3071	1059	0.2538	3884	940	0.2174	905	200	0.191	12884	4164	0.249	0.2547	0.2316
	18715	4107	2702	18348	3054	1830	15302	3594	1830	13308	3148	1845	8545	1578	8335	33158	10769	8587		

BOX II (GMA)

DEP	1988			1989			1990			1991			1992			TOTAL			95% C	
	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Access	Loss	Place	Upper	Lower
1	6012	371	0.0581	8243	524	0.0774	8459	380	0.0452	4381	228	0.054	5180	218	0.0854	26285	1894	0.0588	0.0625	0.0552
2	7702	608	0.0788	10304	619	0.0572	8102	430	0.0515	4781	278	0.0548	5358	388	0.0858	34122	2297	0.0891	0.0958	0.0835
3	4885	488	0.0828	6987	582	0.0748	4898	481	0.095	3544	301	0.0788	5358	514	0.0875	24817	2808	0.085	0.0984	0.0916
4	3948	578	0.1271	5243	388	0.0884	3516	580	0.137	6878	857	0.1185	2878	402	0.1227	18865	2725	0.1201	0.1245	0.1158
5	3855	587	0.1394	1205	344	0.1884	2940	455	0.134	8885	858	0.0885	1270	181	0.1247	18085	2425	0.1185	0.129	0.114
6	1486	343	0.1885	688	308	0.2278	2382	580	0.1845	2802	385	0.1181	480	95	0.191	7878	1688	0.1885	0.1788	0.1807
7	770	280	0.25	522	167	0.3404	2284	551	0.1957	488	160	0.3408	488	117	0.185	3527	1225	0.218	0.2238	0.2022
8	588	171	0.2426	389	138	0.2883	912	310	0.2537	588	171	0.2811	488	194	0.212	2301	625	0.2418	0.2588	0.2278
9	384	136	0.2894	253	117	0.3162	408	167	0.2914	427	198	0.2442	257	87	0.2084	1677	625	0.2716	0.29	0.268
10	231	88	0.2788	234	98	0.2844	237	121	0.338	211	80	0.2748	88	33	0.2588	1008	416	0.2814	0.3165	0.2678
11	177	98	0.3537	177	68	0.2778	231	82	0.3448	185	80	0.2448	84	21	0.2	864	340	0.2348	0.3108	0.2588
12	104	182	0.4458	187	83	0.332	184	78	0.294	211	78	0.2888	77	12	0.198	808	378	0.3201	0.3472	0.2922
	35907	5889	33176	52382	3177	33858	30058	4070	34276	32887	3887	38284	18851	2138	22078	125818	18861	188484		

APPENDIX B: FY-1988-92 PROP LOSS FOR MAJOR MISSION BOXES

BOX III (RMB)

DEP	1988		1989		1990		1991		1992		TOTAL		95% CI	
	Access	Loss	Access	Loss	Access	Loss	Access	Loss	Access	Loss	Access	Loss	Upper	Lower
1	18	41	30	2	0	0	4	0	71	0	200	0	0.283	0.140
2	284	201	198	9	2	0.1818	11	2	200	0.0000	327	0.0000	0.292	0.204
3	305	58	317	20	8	0.2788	98	10	327	0.0071	181	0.0000	0.1161	0.0918
4	713	57	408	53	21	0.2288	300	80	181	0.1228	243	0.0000	0.1198	0.0900
5	521	68	705	105	66	0.2888	767	124	243	0.1851	77	0.0000	0.1448	0.1168
6	808	109	778	116	288	0.3222	473	98	77	0.1716	13	0.0000	0.1788	0.1618
7	1001	129	1085	208	219	0.2455	887	98	13	0.2022	49	0.0000	0.1842	0.1697
8	1117	200	1285	272	280	0.2274	138	24	13	0.18	68	0.0000	0.1862	0.1697
9	1166	220	890	449	118	0.3038	12	5	13	0.2941	24	0.0000	0.2462	0.2178
10	746	185	880	450	38	0.2222	8	6	24	0.5	24	0.0000	0.2962	0.2688
11	862	271	880	408	30	0.3882	3	6	11	0.625	11	0.0000	0.2962	0.2687
12	1217	284	1078	691	11	0.3128	1	2	11	0.887	11	0.0000	0.29	0.2684
	8852	1882	10384	8842	1040	4884	2168	418	1277	2512	1314	3058	6102	3058

BOX IV (RMB)

DEP	1988		1989		1990		1991		1992		TOTAL		95% CI	
	Access	Loss	Access	Loss	Access	Loss	Access	Loss	Access	Loss	Access	Loss	Upper	Lower
1	8589	381	4674	434	118	0.0488	2028	118	1586	0.0761	1586	0.0000	0.0874	0.0508
2	6134	478	8998	2774	288	0.078	1824	132	2802	0.0878	2802	0.0000	0.0788	0.067
3	2881	208	3680	314	348	0.1128	1881	188	2871	0.1087	2871	0.0000	0.0888	0.07
4	820	128	1328	188	347	0.1801	2180	280	988	0.1078	988	0.0000	0.1248	0.1088
5	528	88	405	90	288	0.1888	2882	382	288	0.12	288	0.0000	0.1882	0.1808
6	288	88	220	141	188	0.2288	728	98	105	0.1088	105	0.0000	0.205	0.1787
7	218	88	141	88	88	0.2274	122	31	64	0.2028	64	0.0000	0.2088	0.2082
8	107	27	118	58	48	0.1808	75	24	50	0.2824	50	0.0000	0.2824	0.2824
9	58	28	95	42	75	0.2288	71	17	21	0.1882	21	0.0000	0.2824	0.2824
10	42	28	81	38	72	0.2888	55	16	31	0.2148	31	0.0000	0.2824	0.2824
11	36	16	81	32	58	0.2824	64	7	20	0.1148	20	0.0000	0.2824	0.2824
12	20	21	87	31	42	0.2824	48	8	31	0.1882	31	0.0000	0.2824	0.2824
	17483	1848	18712	1770	1481	18801	11071	1348	8885	42816	8885	7250	7250	7250

APPENDIX B: FY-1988-92 PROF LOSS FOR MAJOR MISSION BOXES

BOX X (CFA)

DEP	1988			1989			1990			1991			1992			TOTAL			RISK Q	
	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Upper	Lower
1	1928	159	0.0781	1800	87	0.0882	1478	84	0.0874	82	0.0874	1076	159	0.1004	7041	791	0.101	0.0982	0.0944	
2	1907	235	0.1228	2108	188	0.0911	1288	189	0.1114	82	0.0882	1168	228	0.1087	9104	1070	0.1078	0.0892		
3	1948	228	0.144	1909	288	0.124	1028	191	0.1384	794	0.1082	1300	228	0.1087	9104	1070	0.1078	0.0892		
4	951	189	0.1882	1132	281	0.1688	708	218	0.2182	1048	411	0.1888	208	0.2097	9105	1289	0.198	0.2008	0.1891	
5	851	204	0.1882	422	188	0.2004	740	282	0.2802	1789	488	0.1977	391	0.2810	4508	1188	0.2804	0.2817	0.2801	
6	402	167	0.2882	184	118	0.2882	884	385	0.3882	804	168	0.2188	187	88	0.3882	2211	802	0.3888	0.3808	0.2782
7	213	108	0.3882	164	78	0.3874	841	287	0.3844	125	87	0.388	122	88	0.3882	1165	808	0.3841	0.3888	0.3218
8	94	88	0.3882	118	82	0.4881	288	128	0.3882	188	116	0.4844	139	88	0.3816	788	411	0.3842	0.419	
9	88	45	0.4884	76	78	0.4881	182	88	0.4881	191	71	0.3816	88	25	0.2812	482	81	0.419	0.419	
10	31	35	0.8882	82	88	0.4881	87	88	0.8788	72	38	0.3882	30	16	0.3882	282	187	0.4118	0.4552	0.33
11	27	28	0.8882	82	48	0.4881	84	31	0.8847	88	28	0.8821	22	8	0.2802	218	138	0.3878	0.4888	0.3888
12	25	28	0.887	48	48	0.8878	80	27	0.8882	88	24	0.8117	27	8	0.3816	188	187	0.488	0.4827	0.3882
TOTAL	1251	887		1818	1485		788	1488		714	1816		6180	880	8182	3882	7887	4188		

BOX XI (GFW)

DEP	1988			1989			1990			1991			1992			TOTAL			RISK Q	
	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Access	Loss	Placed	Upper	Lower
1	1280	85	0.0897	1422	88	0.0861	788	47	0.0884	482	38	0.0841	988	80	0.0882	4885	804	0.0818	0.0888	0.0882
2	1928	187	0.084	1880	178	0.0881	948	28	0.0884	388	38	0.0882	724	84	0.0812	4880	484	0.08	0.0881	0.0818
3	746	88	0.1167	1288	188	0.1088	804	71	0.1088	887	88	0.1048	887	110	0.1478	8270	487	0.1288	0.1408	0.1167
4	308	80	0.1888	822	188	0.1882	188	84	0.2882	815	70	0.1818	408	82	0.1882	2117	428	0.1888	0.1888	0.1887
5	371	88	0.1882	340	88	0.1414	111	34	0.2848	348	88	0.2187	187	34	0.1882	1887	385	0.1887	0.2048	0.1888
6	165	42	0.2882	87	37	0.2781	88	8	0.1882	202	84	0.2187	88	8	0.0782	880	147	0.2822	0.282	0.1724
7	48	28	0.3887	87	28	0.3138	28	18	0.4818	27	8	0.28	82	20	0.3848	188	100	0.3418	0.3887	0.3888
8	20	11	0.3848	82	10	0.2881	34	8	0.1882	48	21	0.2881	84	15	0.1882	188	82	0.2481	0.2888	0.1884
9	11	7	0.3888	38	14	0.2882	12	1	0.0788	48	8	0.1164	18	8	0.2174	128	35	0.2188	0.2811	0.1884
10	8	3	0.8	14	2	0.3882	20	1	0.0788	20	4	0.1887	11	2	0.1888	71	20	0.2188	0.3888	0.188
11	8	3	0.25	18	2	0.1111	11	0	0	28	1	0.0848	16	0	0	79	8	0.0708	0.1882	0.018
12	10	1	0.0882	32	2	0.0882	21	0	0	28	4	0.1212	7	1	0.1288	88	8	0.0748	0.1288	0.0882
TOTAL	888	888		888	888		888	888		888	888		2777	888	8182	1288	887	1881		

APPENDIX C: PROPORTION ACCESSIONS FOR GMA FY88-92

GMA BRIG - I SUMMARY

	ACCESSION				LOSS			
	BLACK	HISP	OTHER	WHITE	BLACK	HISP	OTHER	WHITE
Child	885	188	128	2985	107	15	17	258
No Child	5783	619	738	22134	837	85	120	2886
Total	6668	807	862	25099	944	100	137	3142
Overall	0.875859	0.889746	0.882863	0.888743				
w/Child	0.889918	0.928108	0.881119	0.920522				
w/o Child	0.873585	0.879281	0.859813	0.884652				

GMA BRIG - III SUMMARY

	ACCESSION				LOSS			
	BLACK	HISP	OTHER	WHITE	BLACK	HISP	OTHER	WHITE
Child	1072	412	94	8517	102	24	6	487
No Child	6853	840	378	28003	834	98	70	3450
Total	7725	1252	470	34520	936	122	76	3917
Overall	0.891829	0.911208	0.890808	0.888083				
w/Child	0.913118	0.944854	0.94	0.933133				
w/o Child	0.888807	0.895522	0.843049	0.890313				

GMA BRIG - IV SUMMARY

	ACCESSION				LOSS			
	BLACK	HISP	OTHER	WHITE	BLACK	HISP	OTHER	WHITE
Child	845	802	147	5981	66	30	13	362
No Child	3197	2008	650	23449	489	163	83	2741
Total	3842	2810	797	29430	555	193	96	3103
Overall	0.873778	0.931145	0.882497	0.90462				
w/Child	0.907173	0.952532	0.91875	0.942829				
w/o Child	0.867336	0.924919	0.886787	0.895342				

GMA BRIG - VI SUMMARY

	ACCESSION				LOSS			
	BLACK	HISP	OTHER	WHITE	BLACK	HISP	OTHER	WHITE
Child	212	383	257	3396	41	27	24	280
No Child	1412	2150	1813	18966	279	241	285	2391
Total	1624	2513	2070	22364	320	268	289	2651
Overall	0.835391	0.903632	0.87749	0.894024				
w/Child	0.837945	0.930789	0.914591	0.928823				
w/o Child	0.835009	0.899205	0.872474	0.889046				

# APPENDIX D: COEFFICIENTS FOR FITTED MODEL

Term <sup>1</sup>	Coefficient	T-value
Intercept	2.9489	70.8386
DEP 2	0.8564	20.7224
DEP 3	1.0873	21.6483
DEP 4	1.1244	21.0712
DEP 5	1.3172	21.9937
DEP 6	1.6258	16.7283
DEP 7	1.4663	12.9993
DEP 8	1.9191	11.3314
DEP 9	2.0457	8.8271
DEP 10	2.3308	6.9678
DEP 11	2.2630	6.3743
DEP 12	2.4008	6.3331
ZONE 2	-2.3392	-5.8631
ZONE 3	-2.2915	-5.7102
ZONE 4	-4.1370	-10.7285
MARRIED	-0.4653	-17.3229
HISPANIC	0.3939	8.7309
OTHER	0.0611	1.2649
WHITE	0.2063	9.2504
BRIG III	0.0474	2.1839
BRIG IV	0.0737	3.1831
BRIG VI	-0.0093	-0.3860

NOTE: 1. First level of each term set to 0 by S-Plus.

**APPENDIX D: COEFFICIENTS FOR FITTED MODEL**

<b>Term</b>	<b>Coefficient</b>	<b>T-Value</b>
DEP 2:ZONE 2	1.7314	4.3146
DEP 3:ZONE 2	2.9350	7.2405
DEP 4:ZONE 2	3.9049	9.4196
DEP 5:ZONE 2	3.3384	8.0940
DEP 6:ZONE 2	2.2073	5.2636
DEP 7:ZONE 2	2.1321	5.0068
DEP 8:ZONE 2	1.0163	2.3004
DEP 9:ZONE 2	0.8031	1.6946
DEP 10:ZONE 2	0.2682	0.5015
DEP 11:ZONE 2	0.5655	1.0118
DEP 12:ZONE 2	0	NA <sup>2</sup>
DEP 3:ZONE 3	1.1121	2.7489
DEP 4:ZONE 3	2.2299	5.4832
DEP 5:ZONE 3	2.0110	4.9312
DEP 6:ZONE 3	1.2935	3.1066
DEP 7:ZONE 3	1.2213	2.8970
DEP 8:ZONE 3	0.5839	1.3224
DEP 9:ZONE 3	0.1823	0.3870
DEP 10:ZONE 3	-0.1064	-0.1994
DEP 11:ZONE 3	0.0817	0.1483
DEP 12:ZONE 3	0	NA <sup>2</sup>

NOTE: 2. The model is overdetermined and this coefficient had multiple least square solutions. The coefficient does not contribute to the model.



# **APPENDIX D: COEFFICIENTS FOR FITTED MODEL**

<b>Term</b>	<b>Coefficient</b>	<b>T-value</b>
<b>DEP 4:ZONE 4</b>	<b>2.5705</b>	<b>6.6027</b>
<b>DEP 5:ZONE 4</b>	<b>2.2905</b>	<b>5.8678</b>
<b>DEP 6:ZONE 4</b>	<b>1.5381</b>	<b>3.8617</b>
<b>DEP 7:ZONE 4</b>	<b>1.4057</b>	<b>3.4893</b>
<b>DEP 8:ZONE 4</b>	<b>0.8468</b>	<b>2.0022</b>
<b>DEP 9:ZONE 4</b>	<b>0.5469</b>	<b>1.2074</b>
<b>DEP 10:ZONE 4</b>	<b>0.1949</b>	<b>0.3786</b>
<b>DEP 11:ZONE 4</b>	<b>0.1891</b>	<b>0.3574</b>
<b>DEP 12:ZONE 4</b>	<b>0</b>	<b>NA<sup>1</sup></b>

**NOTE: 2. The model is overdetermined and this coefficient had multiple least square solutions. The coefficient does not contribute to the model.**

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: MARRIED, BLACK, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9502				1	0.9502		
	2	0.9782	0.9607			2	0.9398	0.9607	
	3	0.9826	0.9903	0.9456		3	0.9201	0.9364	0.9456
	4	0.9832	0.9984	0.9822	0.9246	4	0.8897	0.9049	0.9081
	5	0.9861	0.9948	0.9817	0.9183	5	0.8843	0.8968	0.9015
	6	0.9897	0.9883	0.9727	0.8782	6	0.8355	0.8442	0.8542
	7	0.988	0.9853	0.9659	0.8434	7	0.793	0.8027	0.8146
	8	0.9923	0.9719	0.9583	0.8289	8	0.7669	0.7728	0.7952
	9	0.9932	0.9894	0.9471	0.8029	9	0.7321	0.7372	0.7604
	10	0.995	0.9812	0.9471	0.7881	10	0.7139	0.7174	0.7464
	11	0.9946	0.9689	0.9528	0.7756	11	0.7121	0.716	0.739
	12	0.9942	0.9518	0.9531	0.8102	12	0.7306	0.7348	0.7722

## CASE: SINGLE, BLACK, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9229				1	0.9229		
	2	0.9657	0.9389			2	0.9067	0.9389	
	3	0.9726	0.9847	0.9161		3	0.8774	0.9021	0.9161
	4	0.9736	0.9843	0.9719	0.885	4	0.8327	0.8552	0.8601
	5	0.9781	0.9918	0.9712	0.8759	5	0.8252	0.8437	0.8507
	6	0.9838	0.9816	0.9573	0.8191	6	0.7572	0.7697	0.7841
	7	0.9811	0.9768	0.9468	0.7718	7	0.7003	0.7138	0.7307
	8	0.9879	0.958	0.9367	0.7528	8	0.6658	0.6739	0.705
	9	0.9893	0.9522	0.9183	0.7189	9	0.6219	0.6286	0.6602
	10	0.9919	0.9395	0.918	0.7052	10	0.6033	0.6082	0.6474
	11	0.9913	0.9513	0.9266	0.6897	11	0.6027	0.608	0.6391
	12	0.9924	0.9272	0.9304	0.6787	12	0.581	0.5855	0.6315

## CASE: MARRIED, HISPANIC, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9858				1	0.9858		
	2	0.9852	0.9731			2	0.9587	0.9731	
	3	0.9882	0.9934	0.9627		3	0.9451	0.9563	0.9627
	4	0.9888	0.9978	0.9879	0.9478	4	0.9234	0.9341	0.9363
	5	0.9906	0.9965	0.9876	0.9434	5	0.9197	0.9284	0.9317
	6	0.993	0.9921	0.9814	0.9145	6	0.8842	0.8904	0.8975
	7	0.992	0.99	0.9768	0.8863	7	0.8502	0.8571	0.8657
	8	0.9948	0.9809	0.9723	0.8752	8	0.8304	0.8347	0.851
	9	0.9955	0.9792	0.9638	0.855	9	0.8033	0.8089	0.824
	10	0.9966	0.9735	0.9637	0.8465	10	0.7915	0.7942	0.8158
	11	0.9933	0.9788	0.9677	0.8367	11	0.7896	0.7925	0.8097
	12	0.996	0.9868	0.9679	0.8632	12	0.8045	0.8078	0.8355

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: SINGLE, HISPANIC, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9467			1	0.9467			
	2	0.9766	0.9579		2	0.9355	0.9579		
	3	0.9813	0.9896	0.9418	3	0.9146	0.932	0.9418	
	4	0.982	0.9961	0.9809	4	0.8822	0.8983	0.9018	0.9194
	5	0.9851	0.9944	0.9804	5	0.8765	0.8898	0.8948	0.9127
	6	0.988	0.9875	0.9708	6	0.8252	0.8344	0.845	0.8704
	7	0.9873	0.9843	0.9636	7	0.7776	0.7876	0.8002	0.8304
	8	0.9919	0.97	0.9586	8	0.75	0.7561	0.7795	0.8149
	9	0.9928	0.9873	0.9436	9	0.7135	0.7187	0.743	0.7874
	10	0.9945	0.9584	0.9432	10	0.7013	0.7052	0.7358	0.7801
	11	0.9942	0.9667	0.9495	11	0.6962	0.7003	0.7244	0.7629
	12	0.9937	0.9482	0.9498	12	0.7151	0.7197	0.759	0.7991

## CASE: MARRIED, OTHER, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.953			1	0.953			
	2	0.9799	0.9632		2	0.9438	0.9632		
	3	0.9837	0.9809	0.9487	3	0.9248	0.9401	0.9487	
	4	0.9842	0.9867	0.9833	4	0.8958	0.9102	0.9132	0.9288
	5	0.987	0.9952	0.9828	5	0.8908	0.9025	0.9089	0.9228
	6	0.9904	0.9891	0.9744	6	0.8443	0.8525	0.862	0.8846
	7	0.9889	0.9882	0.968	7	0.8009	0.8099	0.8212	0.8483
	8	0.9929	0.9738	0.9819	8	0.7727	0.7782	0.7992	0.8309
	9	0.9939	0.9714	0.9505	9	0.7388	0.7433	0.7652	0.8051
	10	0.9953	0.9635	0.9501	10	0.7273	0.7307	0.7584	0.7982
	11	0.9951	0.9708	0.9557	11	0.7221	0.7257	0.7475	0.7821
	12	0.9946	0.9544	0.9558	12	0.7434	0.7475	0.7832	0.8194

## CASE: SINGLE, OTHER, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.929			1	0.929			
	2	0.9677	0.9423		2	0.9119	0.9423		
	3	0.9742	0.9856	0.9208	3	0.8841	0.9075	0.9208	
	4	0.9751	0.9947	0.9738	4	0.8416	0.863	0.8676	0.8912
	5	0.9794	0.9923	0.9729	5	0.8344	0.8519	0.8585	0.8824
	6	0.9848	0.9827	0.9598	6	0.7691	0.781	0.7947	0.828
	7	0.9822	0.9782	0.9498	7	0.714	0.727	0.7432	0.7824
	8	0.9886	0.9586	0.9403	8	0.6806	0.6884	0.7182	0.7638
	9	0.9901	0.9551	0.9231	9	0.6341	0.6405	0.6706	0.7284
	10	0.9928	0.9431	0.9228	10	0.6159	0.6205	0.6579	0.7129
	11	0.992	0.9542	0.931	11	0.6148	0.6198	0.6495	0.6977
	12	0.9914	0.9293	0.9314	12	0.636	0.6416	0.6904	0.7412

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: MARRIED, WHITE, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9591			1	0.9591			
	2	0.9822	0.9678		2	0.9506	0.9678		
	3	0.9858	0.9921	0.9554	3	0.9344	0.9478	0.9554	
	4	0.9883	0.9971	0.9855	4	0.9089	0.9215	0.9242	0.9378
	5	0.9887	0.9958	0.9851	5	0.9045	0.9148	0.9186	0.9325
	6	0.9917	0.9905	0.9778	6	0.8631	0.8703	0.8787	0.8986
	7	0.9903	0.988	0.9721	7	0.8263	0.8345	0.8446	0.8688
	8	0.9938	0.9771	0.9667	8	0.8037	0.8087	0.8277	0.8582
	9	0.9945	0.975	0.9566	9	0.7732	0.7774	0.7973	0.8335
	10	0.9959	0.9683	0.9566	10	0.7569	0.76	0.7849	0.8206
	11	0.9958	0.9745	0.9612	11	0.7583	0.7617	0.7816	0.8131
	12	0.9982	0.9615	0.9632	12	0.7428	0.7457	0.7756	0.8052

## CASE: SINGLE, WHITE, BRIG I

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9364			1	0.9364			
	2	0.972	0.9497		2	0.9231	0.9497		
	3	0.9776	0.9875	0.9307	3	0.8986	0.9191	0.9307	
	4	0.9784	0.9954	0.9771	4	0.8607	0.8797	0.8837	0.9045
	5	0.9821	0.9933	0.9765	5	0.8542	0.8698	0.8756	0.8967
	6	0.9868	0.985	0.985	6	0.7952	0.8058	0.8181	0.8477
	7	0.9846	0.9811	0.9563	7	0.7447	0.7563	0.7709	0.8061
	8	0.9901	0.984	0.9479	8	0.7139	0.721	0.7479	0.789
	9	0.9913	0.9808	0.9326	9	0.6739	0.6798	0.7075	0.7587
	10	0.9934	0.9503	0.9323	10	0.6568	0.6611	0.6958	0.7463
	11	0.993	0.9601	0.9395	11	0.6557	0.6603	0.6878	0.7321
	12	0.9939	0.94	0.9426	12	0.6357	0.6397	0.6805	0.7219

## CASE: MARRIED, BLACK, BRIG II

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9524			1	0.9524			
	2	0.9792	0.9625		2	0.9425	0.9625		
	3	0.9834	0.9908	0.9481	3	0.9238	0.9393	0.9481	
	4	0.984	0.9986	0.983	4	0.8945	0.909	0.9121	0.9279
	5	0.9868	0.9951	0.9826	5	0.8877	0.8996	0.904	0.9201
	6	0.9903	0.9889	0.974	6	0.8425	0.8507	0.8603	0.8832
	7	0.9888	0.9861	0.9676	7	0.7986	0.8077	0.8191	0.8465
	8	0.9928	0.9733	0.9613	8	0.7731	0.7786	0.8	0.8322
	9	0.9937	0.9709	0.9496	9	0.739	0.7437	0.766	0.8066
	10	0.9952	0.963	0.9495	10	0.7243	0.7278	0.7558	0.796
	11	0.9948	0.9703	0.9548	11	0.726	0.7298	0.7521	0.7878
	12	0.9945	0.9538	0.9552	12	0.7406	0.7447	0.7808	0.8174

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: SINGLE, BLACK, BRIG II

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9263				D E P	1	0.9263			
	2	0.9673	0.9416				2	0.9108	0.9416		
	3	0.9739	0.9854	0.9198			3	0.8827	0.9064	0.9198	
	4	0.9748	0.9946	0.9732	0.8898		4	0.8397	0.8614	0.866	0.8898
	5	0.9791	0.9922	0.9726	0.881		5	0.8324	0.8501	0.8568	0.881
	6	0.9813	0.9824	0.9583	0.8261		6	0.7065	0.7785	0.7924	0.8261
	7	0.982	0.9779	0.9482	0.7801		7	0.711	0.7241	0.7404	0.7801
	8	0.9835	0.958	0.8395	0.7613		8	0.6773	0.6852	0.7153	0.7613
	9	0.9899	0.9544	0.9218	0.7237		9	0.6302	0.6367	0.6671	0.7237
	10	0.9923	0.9422	0.9216	0.715		10	0.6161	0.6208	0.6589	0.715
	11	0.9918	0.9535	0.9298	0.6948		11	0.6109	0.616	0.646	0.6948
	12	0.9928	0.9304	0.9334	0.6889		12	0.594	0.5982	0.643	0.6889

## CASE: MARRIED, HISPANIC, BRIG II

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9882				D E P	1	0.9682			
	2	0.9862	0.9745				2	0.9611	0.9745		
	3	0.9888	0.9937	0.9641			3	0.9473	0.958	0.9641	
	4	0.9892	0.9977	0.9885	0.949		4	0.9258	0.936	0.9381	0.946
	5	0.9911	0.9967	0.9882	0.9459		5	0.9233	0.9316	0.9347	0.9459
	6	0.9935	0.9925	0.9824	0.9163		6	0.8877	0.8935	0.9002	0.9163
	7	0.9924	0.9906	0.9779	0.891		7	0.8566	0.8631	0.8714	0.891
	8	0.9952	0.9818	0.9736	0.8803		8	0.8374	0.8415	0.857	0.8803
	9	0.9957	0.9802	0.9655	0.8608		9	0.8112	0.8147	0.8311	0.8608
	10	0.9968	0.9747	0.9654	0.8526		10	0.7997	0.8023	0.8231	0.8526
	11	0.9986	0.9798	0.9692	0.8431		11	0.7979	0.8008	0.8171	0.8431
	12	0.9983	0.9624	0.9694	0.8687		12	0.8124	0.8154	0.8421	0.8687

## CASE: SINGLE, HISPANIC, BRIG II

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9491				D E P	1	0.9491			
	2	0.9777	0.9593				2	0.9384	0.9598		
	3	0.9822	0.9901	0.9444			3	0.9185	0.9351	0.9444	
	4	0.9829	0.9964	0.9818	0.9229		4	0.8874	0.9028	0.9061	0.9229
	5	0.9858	0.9947	0.9813	0.9165		5	0.882	0.8946	0.8994	0.9165
	6	0.9897	0.9881	0.9723	0.873		6	0.8301	0.8387	0.8488	0.873
	7	0.9878	0.985	0.9651	0.837		7	0.786	0.7957	0.8078	0.837
	8	0.9922	0.9713	0.9584	0.8255		8	0.7624	0.7684	0.7911	0.8255
	9	0.9932	0.9689	0.9461	0.7952		9	0.724	0.729	0.7524	0.7952
	10	0.9948	0.9603	0.9459	0.7941		10	0.7086	0.7123	0.7417	0.7841
	11	0.9945	0.9682	0.9518	0.7714		11	0.707	0.7109	0.7342	0.7714
	12	0.9941	0.9506	0.9521	0.8066		12	0.7257	0.73	0.768	0.8066

# APPENDIX B: FITTED VALUES AND COND PROBABILITIES

## CASE: MARRIED, OTHER, BRIG II

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9551			1	0.9551			
	2	0.9804	0.9648		2	0.946	0.9648		
	3	0.9845	0.9913	0.9506	3	0.9276	0.9423	0.9506	
	4	0.9852	0.9968	0.9841	0.9303	4	0.8991	0.9126	0.9155
	5	0.9876	0.9954	0.9836	0.9261	5	0.8954	0.9067	0.9109
	6	0.991	0.9896	0.9758	0.887	6	0.8487	0.8584	0.8654
	7	0.9894	0.9889	0.9695	0.8543	7	0.8087	0.8173	0.8282
	8	0.9833	0.9748	0.9635	0.8406	8	0.7842	0.7895	0.8099
	9	0.9942	0.9727	0.9527	0.8124	9	0.7484	0.7528	0.774
	10	0.9956	0.9652	0.9525	0.802	10	0.7341	0.7374	0.7639
	11	0.9952	0.9721	0.9575	0.7939	11	0.7354	0.739	0.7602
	12	0.9939	0.9552	0.956	0.8631	12	0.7833	0.7881	0.8251

## CASE: SINGLE, OTHER, BRIG II

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9304			1	0.9304			
	2	0.9892	0.9448		2	0.9157	0.9448		
	3	0.9754	0.9863	0.9241	3	0.889	0.9115	0.9241	
	4	0.9763	0.9949	0.9748	0.8957	4	0.8481	0.8687	0.8731
	5	0.9803	0.9927	0.9742	0.8848	5	0.8389	0.8557	0.862
	6	0.9855	0.9835	0.9616	0.8347	6	0.7779	0.7893	0.8026
	7	0.9833	0.9782	0.9522	0.7864	7	0.721	0.7333	0.7488
	8	0.9891	0.9804	0.9429	0.7723	8	0.6917	0.6993	0.7282
	9	0.9906	0.9571	0.9264	0.7358	9	0.6462	0.6524	0.6816
	10	0.9929	0.9456	0.9262	0.7226	10	0.6283	0.6328	0.6692
	11	0.9924	0.9562	0.934	0.7076	11	0.6271	0.6319	0.6609
	12	0.9918	0.9323	0.9344	0.7501	12	0.6481	0.6535	0.7009

## CASE: MARRIED, WHITE, BRIG II

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9809			1	0.9809			
	2	0.983	0.9693		2	0.9528	0.9693		
	3	0.9865	0.9925	0.9573	3	0.9373	0.9502	0.9573	
	4	0.987	0.9972	0.9882	0.9405	4	0.9129	0.9249	0.9275
	5	0.9892	0.996	0.9858	0.9354	5	0.9086	0.9185	0.9222
	6	0.9921	0.991	0.9788	0.9029	6	0.8688	0.8757	0.8837
	7	0.9907	0.9888	0.9734	0.8741	7	0.8333	0.8411	0.8508
	8	0.9941	0.9781	0.9681	0.862	8	0.8114	0.8162	0.8345
	9	0.9948	0.9762	0.9585	0.84	9	0.7818	0.788	0.8051
	10	0.9961	0.9696	0.9583	0.8308	10	0.769	0.772	0.7962
	11	0.9959	0.9758	0.963	0.8167	11	0.7643	0.7674	0.7865
	12	0.9955	0.9621	0.9633	0.846	12	0.7805	0.784	0.8149

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: SINGLE, WHITE, BRIG II

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Z4 Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9392			1	0.9392			
	2	0.9732	0.9519		2	0.9265	0.9519		
	3	0.9786	0.9881	0.9337	3	0.9029	0.9226	0.9337	
	4	0.9794	0.9956	0.8781	4	0.8665	0.8647	0.8886	0.9085
	5	0.983	0.9937	0.9776	5	0.8603	0.8752	0.8808	0.901
	6	0.9874	0.9857	0.9688	6	0.8032	0.8134	0.8252	0.8538
	7	0.9853	0.982	0.9583	7	0.7541	0.7654	0.7795	0.8134
	8	0.9908	0.9656	0.9502	8	0.7242	0.7311	0.7571	0.7968
	9	0.9917	0.9826	0.9355	9	0.6852	0.6909	0.7178	0.7673
	10	0.9837	0.9525	0.9352	10	0.6685	0.6727	0.7062	0.7551
	11	0.9834	0.9619	0.9424	11	0.6634	0.6678	0.6942	0.7367
	12	0.9842	0.9426	0.9452	12	0.6477	0.6515	0.6912	0.7313

## CASE: MARRIED, BLACK, BRIG III

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9536			1	0.9536			
	2	0.9798	0.9834		2	0.9439	0.9834		
	3	0.9839	0.991	0.9493	3	0.9256	0.9408	0.9493	
	4	0.9844	0.9867	0.9835	4	0.897	0.9112	0.9142	0.9296
	5	0.9871	0.9852	0.983	5	0.882	0.9037	0.908	0.9237
	6	0.9905	0.9892	0.9747	6	0.8461	0.8542	0.8635	0.8859
	7	0.9891	0.9884	0.9884	7	0.803	0.8119	0.8231	0.8499
	8	0.9929	0.9739	0.9621	8	0.7777	0.7832	0.8042	0.8359
	9	0.9939	0.9717	0.9509	9	0.7444	0.749	0.7709	0.8107
	10	0.9954	0.9639	0.9507	10	0.7299	0.7333	0.7608	0.8002
	11	0.995	0.9711	0.9561	11	0.7282	0.7318	0.7536	0.7882
	12	0.9956	0.9582	0.9582	12	0.7492	0.7525	0.7869	0.8213

## CASE: SINGLE, BLACK, BRIG III

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9281			1	0.9281			
	2	0.9681	0.943		2	0.913	0.943		
	3	0.9745	0.9858	0.9217	3	0.8855	0.9086	0.9217	
	4	0.9754	0.9848	0.9739	4	0.8433	0.8646	0.8691	0.8824
	5	0.9797	0.9824	0.9732	5	0.8362	0.8536	0.8601	0.8837
	6	0.985	0.9829	0.9803	6	0.7715	0.7832	0.7969	0.8298
	7	0.9824	0.9785	0.9504	7	0.7168	0.7296	0.7457	0.7846
	8	0.9888	0.9591	0.941	8	0.6836	0.6914	0.7209	0.7661
	9	0.9902	0.9556	0.924	9	0.6374	0.6437	0.6735	0.7289
	10	0.9926	0.9437	0.9237	10	0.6192	0.6238	0.661	0.7155
	11	0.992	0.9546	0.9315	11	0.6222	0.6272	0.657	0.7053
	12	0.9915	0.9301	0.9322	12	0.6393	0.6448	0.6932	0.7436

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: MARRIED, HISPANIC, BRIG III

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9882			1	0.9882			
	2	0.9863	0.975		2	0.9616	0.975		
	3	0.9891	0.9839	0.9653	3	0.9489	0.9594	0.9653	
	4	0.9885	0.9978	0.9888	4	0.9288	0.9387	0.9407	0.9514
	5	0.9913	0.9968	0.9885	5	0.9252	0.9333	0.9383	0.9472
	6	0.9937	0.9927	0.9829	6	0.8903	0.896	0.9026	0.9183
	7	0.9928	0.9908	0.9785	7	0.8599	0.8683	0.8743	0.8936
	8	0.9853	0.9823	0.9742	8	0.8411	0.8451	0.8603	0.8831
	9	0.9858	0.9807	0.9663	9	0.8154	0.8188	0.8349	0.8639
	10	0.9869	0.9754	0.9662	10	0.8041	0.8086	0.827	0.8559
	11	0.9867	0.9803	0.9699	11	0.8023	0.805	0.8211	0.8466
	12	0.9857	0.9683	0.9689	12	0.841	0.8446	0.8723	0.9003

## CASE: SINGLE, HISPANIC, BRIG III

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9503			1	0.9503			
	2	0.9783	0.9608		2	0.94	0.9608		
	3	0.9827	0.9904	0.9458	3	0.9205	0.9387	0.9458	
	4	0.9633	0.9965	0.9823	4	0.8901	0.9052	0.9084	0.9248
	5	0.9862	0.9949	0.9818	5	0.8848	0.8972	0.9018	0.9185
	6	0.9898	0.9884	0.9729	6	0.8337	0.8423	0.8522	0.8759
	7	0.9881	0.9854	0.966	7	0.7936	0.8032	0.8151	0.8437
	8	0.9924	0.972	0.9594	8	0.7674	0.7733	0.7856	0.8283
	9	0.9934	0.9696	0.9474	9	0.7296	0.7345	0.7575	0.7995
	10	0.9949	0.9613	0.9471	10	0.7178	0.7215	0.7506	0.7925
	11	0.9946	0.969	0.9528	11	0.7183	0.7202	0.7433	0.7802
	12	0.9942	0.9518	0.9533	12	0.7313	0.7355	0.7728	0.8107

## CASE: MARRIED, OTHER, BRIG III

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9573			1	0.9573			
	2	0.9809	0.9655		2	0.9471	0.9655		
	3	0.9849	0.9815	0.9518	3	0.9294	0.9437	0.9518	
	4	0.9856	0.9869	0.9845	4	0.9015	0.9147	0.9176	0.932
	5	0.9879	0.9855	0.984	5	0.8979	0.909	0.9131	0.9279
	6	0.9912	0.9899	0.9762	6	0.8521	0.8597	0.8685	0.8896
	7	0.9897	0.9872	0.9702	7	0.8129	0.8214	0.832	0.8575
	8	0.9933	0.9754	0.9843	8	0.7915	0.7968	0.8169	0.8472
	9	0.9942	0.9733	0.9537	9	0.7566	0.761	0.7819	0.8199
	10	0.9957	0.9661	0.9537	10	0.7398	0.7428	0.7688	0.8062
	11	0.9953	0.9728	0.9586	11	0.7408	0.7443	0.7651	0.7982
	12	0.994	0.9563	0.9571	12	0.788	0.7928	0.829	0.8662



# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: SINGLE, OTHER, BRIG III

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.932				1	0.932				
	2	0.97	0.9462			2	0.9178	0.9462			
	3	0.976	0.9886	0.926		3	0.8917	0.9136	0.926		
	4	0.9789	0.9951	0.9754	0.8981	4	0.8516	0.8717	0.876	0.8981	
	5	0.9808	0.9929	0.9748	0.8899	5	0.8447	0.8612	0.8674	0.8899	
	6	0.9859	0.9839	0.9625	0.8383	6	0.7827	0.7939	0.8069	0.8383	
	7	0.9835	0.9797	0.9532	0.7947	7	0.7299	0.7422	0.7575	0.7947	
	8	0.9894	0.9814	0.9443	0.7769	8	0.6978	0.7053	0.7336	0.7769	
	9	0.9908	0.9582	0.9282	0.7408	9	0.6528	0.6589	0.6876	0.7408	
	10	0.9831	0.9469	0.9279	0.7278	10	0.6351	0.6395	0.6754	0.7278	
	11	0.9826	0.9573	0.9356	0.713	11	0.6339	0.6386	0.6671	0.713	
	12	0.992	0.934	0.936	0.7549	12	0.6547	0.66	0.7086	0.7549	

## CASE: MARRIED, WHITE, BRIG III

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9619				1	0.9619				
	2	0.9635	0.9701			2	0.954	0.9701			
	3	0.9668	0.9827	0.9584		3	0.9389	0.9514	0.9584		
	4	0.9873	0.9873	0.9865	0.942	4	0.915	0.9268	0.9293	0.942	
	5	0.9885	0.9861	0.9862	0.937	5	0.9108	0.9204	0.924	0.937	
	6	0.9923	0.9812	0.9793	0.9052	6	0.8718	0.8786	0.8884	0.9052	
	7	0.9909	0.9889	0.974	0.877	7	0.8371	0.8447	0.8542	0.877	
	8	0.9942	0.9787	0.989	0.8651	8	0.8156	0.8203	0.8382	0.8651	
	9	0.9949	0.9788	0.9585	0.8435	9	0.7888	0.7906	0.8094	0.8435	
	10	0.9982	0.9704	0.9585	0.8312	10	0.771	0.7739	0.7978	0.8312	
	11	0.996	0.9784	0.964	0.8208	11	0.7692	0.7723	0.791	0.8208	
	12	0.9956	0.963	0.9642	0.8493	12	0.7852	0.7887	0.8189	0.8493	

## CASE: SINGLE, WHITE, BRIG III

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9407				1	0.9407				
	2	0.9739	0.9531			2	0.9283	0.9531			
	3	0.9792	0.9684	0.9353		3	0.9053	0.9245	0.9353		
	4	0.9799	0.9857	0.9787	0.9107	4	0.8898	0.8874	0.8912	0.9107	
	5	0.9834	0.9838	0.9781	0.9033	5	0.8635	0.8781	0.8835	0.9033	
	6	0.9877	0.986	0.9674	0.857	6	0.8075	0.8175	0.8291	0.857	
	7	0.9857	0.9824	0.9593	0.8174	7	0.7593	0.7703	0.7841	0.8174	
	8	0.9908	0.9864	0.9514	0.801	8	0.7298	0.7366	0.7621	0.801	
	9	0.9919	0.9835	0.937	0.772	9	0.6913	0.697	0.7234	0.772	
	10	0.9939	0.9536	0.9388	0.76	10	0.6748	0.679	0.712	0.76	
	11	0.9935	0.9628	0.9436	0.7463	11	0.6736	0.678	0.7042	0.7463	
	12	0.9943	0.944	0.9442	0.7805	12	0.6917	0.6957	0.7369	0.7805	

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: MARRIED, BLACK, BRIG VI

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9498			1	0.9498			
	2	0.978	0.9604		2	0.9393	0.9804		
	3	0.9825	0.9902	0.9447	3	0.9191	0.9355	0.9447	
	4	0.9831	0.9984	0.9821	4	0.8889	0.9041	0.9074	0.924
	5	0.9883	0.9948	0.9817	5	0.8821	0.8943	0.899	0.9158
	6	0.9897	0.9883	0.9725	6	0.8345	0.8432	0.8532	0.8772
	7	0.9881	0.9853	0.9658	7	0.7889	0.7983	0.8103	0.839
	8	0.9923	0.9717	0.959	8	0.7652	0.7712	0.7938	0.8276
	9	0.9933	0.9893	0.9469	9	0.7272	0.732	0.7552	0.7976
	10	0.995	0.9809	0.9467	10	0.712	0.7156	0.7447	0.7866
	11	0.9946	0.9887	0.9524	11	0.7103	0.7141	0.7372	0.774
	12	0.9931	0.9496	0.9508	12	0.761	0.7663	0.8068	0.8486

## CASE: SINGLE, BLACK, BRIG VI

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9223			1	0.9223			
	2	0.9655	0.9384		2	0.906	0.9384		
	3	0.9724	0.9846	0.9155	3	0.8765	0.9014	0.9155	
	4	0.9734	0.9943	0.9717	4	0.8315	0.8543	0.8581	0.8841
	5	0.9779	0.9818	0.971	5	0.8239	0.8425	0.8495	0.8749
	6	0.9837	0.9814	0.957	6	0.7555	0.7681	0.7826	0.8178
	7	0.9812	0.9767	0.9468	7	0.6949	0.7081	0.725	0.7659
	8	0.988	0.9558	0.9384	8	0.66	0.668	0.689	0.7464
	9	0.9892	0.9518	0.9177	9	0.6196	0.6283	0.658	0.7171
	10	0.992	0.9392	0.9177	10	0.597	0.6019	0.6408	0.6983
	11	0.9915	0.951	0.9283	11	0.5962	0.6014	0.6323	0.6826
	12	0.9924	0.9286	0.9298	12	0.5785	0.5829	0.6291	0.6766

## CASE: MARRIED, HISPANIC, BRIG VI

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9656			1	0.9656			
	2	0.9851	0.9729		2	0.9584	0.9729		
	3	0.9881	0.9934	0.9624	3	0.9447	0.956	0.9624	
	4	0.9885	0.9976	0.9878	4	0.9229	0.9336	0.9359	0.9474
	5	0.9905	0.9965	0.9875	5	0.9191	0.9279	0.9311	0.9429
	6	0.993	0.9921	0.9813	6	0.8834	0.8896	0.8967	0.9138
	7	0.992	0.99	0.9767	7	0.8492	0.8561	0.8647	0.8854
	8	0.9949	0.9808	0.9721	8	0.8292	0.8335	0.8498	0.8742
	9	0.9954	0.979	0.9634	9	0.8044	0.8082	0.8255	0.8568
	10	0.9966	0.9733	0.9634	10	0.79	0.7927	0.8144	0.8453
	11	0.9964	0.9787	0.9674	11	0.7881	0.791	0.8083	0.8355
	12	0.9953	0.9656	0.9662	12	0.6289	0.6328	0.6625	0.6926

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: SINGLE, HISPANIC, BRIG VI

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9463				1	0.9463				
	2	0.9784	0.9576			2	0.935	0.9576			
	3	0.9812	0.9896	0.9414		3	0.914	0.9315	0.9414		
	4	0.9819	0.9862	0.9808	0.9188	4	0.8814	0.8977	0.9011	0.9188	
	5	0.985	0.9844	0.9803	0.9121	5	0.8757	0.8891	0.894	0.9121	
	6	0.9889	0.9874	0.9708	0.8894	6	0.8239	0.8331	0.8438	0.8894	
	7	0.9873	0.9842	0.9633	0.8291	7	0.7761	0.7861	0.7967	0.8291	
	8	0.9819	0.9897	0.9582	0.8136	8	0.7483	0.7544	0.778	0.8136	
	9	0.9827	0.967	0.9429	0.7898	9	0.7149	0.7202	0.7448	0.7898	
	10	0.9846	0.9581	0.943	0.7744	10	0.6859	0.6997	0.7302	0.7744	
	11	0.9842	0.9864	0.9491	0.7613	11	0.6842	0.6883	0.7225	0.7613	
	12	0.9837	0.9478	0.9494	0.7977	12	0.7133	0.7178	0.7574	0.7977	

## CASE: MARRIED, OTHER, BRIG VI

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9526				1	0.9526				
	2	0.9793	0.9627			2	0.9427	0.9627			
	3	0.9835	0.9908	0.9483		3	0.9241	0.9396	0.9483		
	4	0.9841	0.9886	0.9831	0.9282	4	0.8849	0.9094	0.9125	0.9282	
	5	0.9868	0.9851	0.9827	0.9221	5	0.8898	0.9017	0.9061	0.9221	
	6	0.9903	0.989	0.9741	0.8837	6	0.8431	0.8513	0.8608	0.8837	
	7	0.9888	0.9861	0.9677	0.8471	7	0.7993	0.8084	0.8198	0.8471	
	8	0.9828	0.9733	0.9613	0.8361	8	0.7767	0.7823	0.8038	0.8361	
	9	0.9936	0.971	0.9497	0.811	9	0.743	0.7478	0.7702	0.811	
	10	0.9953	0.9832	0.9497	0.7967	10	0.7253	0.7287	0.7586	0.7967	
	11	0.9949	0.9705	0.9551	0.7845	11	0.7235	0.7272	0.7493	0.7845	
	12	0.9945	0.954	0.9554	0.818	12	0.7415	0.7456	0.7816	0.818	

## CASE: SINGLE, OTHER, BRIG VI

		Conditional Prob (fitted) of Surviving Past Zone (i)						Prob of Accession Given Survived Zone (i-1)			
		ZONE						ZONE			
		1	2	3	4			1	2	3	4
D E P	1	0.9286				1	0.9286				
	2	0.9675	0.9418			2	0.9112	0.9418			
	3	0.974	0.9855	0.9201		3	0.8831	0.9067	0.9201		
	4	0.9749	0.9947	0.9734	0.8903	4	0.8403	0.8519	0.8685	0.8903	
	5	0.9798	0.9823	0.9728	0.8789	5	0.831	0.8484	0.855	0.8789	
	6	0.9847	0.9825	0.9594	0.8267	6	0.7673	0.7793	0.7932	0.8267	
	7	0.982	0.978	0.9494	0.7808	7	0.712	0.725	0.7413	0.7808	
	8	0.9885	0.9582	0.9397	0.7578	8	0.6745	0.6824	0.7121	0.7578	
	9	0.99	0.9547	0.9224	0.7246	9	0.6317	0.6381	0.6884	0.7246	
	10	0.9925	0.9426	0.9222	0.711	10	0.6134	0.618	0.6557	0.711	
	11	0.9918	0.9537	0.9301	0.7007	11	0.6165	0.6216	0.6517	0.7007	
	12	0.9913	0.9287	0.9308	0.7394	12	0.6336	0.6392	0.6883	0.7394	

# APPENDIX E: FITTED VALUES AND COND PROBABILITIES

## CASE: MARRIED, WHITE, BRIG VI

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9588			1	0.9588			
	2	0.9821	0.9675		2	0.9502	0.9675		
	3	0.9857	0.9921	0.955	3	0.9338	0.9474	0.955	
	4	0.9862	0.9971	0.9854	4	0.9082	0.9208	0.9235	0.9373
	5	0.9886	0.9958	0.985	5	0.9036	0.914	0.9179	0.9319
	6	0.9916	0.9904	0.9776	6	0.862	0.8692	0.8776	0.8978
	7	0.9902	0.9879	0.9719	7	0.825	0.8331	0.8433	0.8677
	8	0.9937	0.9768	0.9684	8	0.8021	0.8072	0.8263	0.8551
	9	0.9946	0.9749	0.9583	9	0.7686	0.7728	0.7927	0.8289
	10	0.9959	0.968	0.9562	10	0.7551	0.7582	0.7633	0.8192
	11	0.9956	0.9744	0.961	11	0.7533	0.7586	0.7765	0.8081
	12	0.9961	0.9611	0.9629	12	0.7409	0.7438	0.7739	0.8037

## CASE: SINGLE, WHITE, BRIG VI

Conditional Prob (fitted) of Surviving Past Zone (i)					Prob of Accession Given Survived Zone (i-1)				
ZONE					ZONE				
	1	2	3	4		1	2	3	4
D E P	1	0.9359			1	0.9359			
	2	0.9717	0.9493		2	0.9224	0.9493		
	3	0.9774	0.9874	0.9301	3	0.8977	0.9184	0.9301	
	4	0.9762	0.9954	0.9769	4	0.8585	0.8787	0.8828	0.9037
	5	0.982	0.9933	0.9763	5	0.853	0.8887	0.8745	0.8958
	6	0.9887	0.9849	0.9647	6	0.7936	0.8043	0.8167	0.8485
	7	0.9844	0.9809	0.9559	7	0.7428	0.7545	0.7692	0.8047
	8	0.99	0.9836	0.9475	8	0.7118	0.719	0.7461	0.7875
	9	0.9912	0.9805	0.932	9	0.6717	0.6776	0.7055	0.757
	10	0.9934	0.9498	0.9317	10	0.6545	0.6589	0.6937	0.7445
	11	0.993	0.9598	0.9392	11	0.6495	0.6541	0.6814	0.7255
	12	0.9938	0.9395	0.9421	12	0.6334	0.6373	0.6783	0.72

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